

# Disaster Debris Management



California Governor's Office of Emergency Services  
Technical Assistance Programs  
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# Debris Management Overview


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## Introduction



### It's Not Taking Out The Trash

- Debris removal costs average 40% of the total cost of a disaster
- Debris quantities in natural events are increasing
- Are we experiencing more natural disasters?
  - Building more developments in hazardous areas
  - Building larger and more complex facilities
- Between 2003-2011, debris removal costs for California disasters was approximately \$228.6 million

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Disaster debris management costs average out to be 40% of the total cost of any given disaster. Since 2003, disaster debris costs in California have totaled approximately \$228.6 million.

To effectively prepare for and respond to debris-related issues, it is necessary to have an understanding of the types of debris that are generated in the various disasters.



In this chapter we will talk about:

- Typical disasters types and resulting debris.
- Typical debris situations that may be encountered in actual disasters.
- What you should consider in creating a disaster debris management plan.
- Issues that have arisen in recent disasters and what we've learned.

## Disaster Type & Characteristics

**Storm, Flood, Tsunami, Seiche & Dam Failure Characteristics**


- High velocity flows
- Several large waves
- Surges
- Inundation
- Landslides




*Wakui, Japan - March 2011*

*St. Francis Dam - March 1938*

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**Storm, Flood, Tsunami, Seiche & Dam Failure Debris**

- Sediment
- Electronic debris
- Personal property
- Metals
- Vegetative debris
- Animal carcasses
- Sandbags
- White metals
- Construction & demolition material
- Human remains
- Hazardous household waste
- Vehicles & boats




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### Storms/Floods

- Characteristics:
  - High velocity flows
  - Inundation
  - Landslides
- Most areas of the country have experienced natural disasters in flooding – from the slow-rising expansive type seen in the Midwest to the flash flooding in the western and eastern mountain areas
- Structural damage may occur from flood saturation and from high velocity flow and forces from sediment transport
- Floods are often the most difficult disaster events relative to debris:
  - Often, all possessions are destroyed
    - ◆ Clothes, furniture, personal affects
    - ◆ Carpet, sheetrock, wood
  - Debris is put out for collection in waves for long periods of time
    - ◆ As water levels recede
    - ◆ Emotionally difficult to part with items
    - ◆ Some (particularly the elderly) may need assistance in moving objects
    - ◆ Delays due to homeowners waiting for Hazard Mitigation Grant Program (HMGP) buyout offers
- Secondary Impacts: Landslides, erosion of homes, facilities, fires, roads, trees, and falling boulders




## Storm, Flood & Tsunami Events



### Storm, Flood & Tsunami Debris Removal Costs

- 1998 – DR-1203 El Nino, \$43.4 million
- 2005 – DR-1577 January Storms, \$41.9 million
- 2005 – DR-1585 February Winter Storms, \$19.2 million
- 2006 – DR-1628, 05/06 Winter Storms, \$12 million
- 2006 – DR-1646 2006 Spring Storms, \$3.8 million
- 2010 – DR-1884 2010 Severe Winter Storms, \$38 million
- 2010 – DR-1952 December 2010 Statewide Storms, \$11.7 million
- 2011 – DR-1968 March 2011 California Tsunami, \$12.9 million

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### Storm Events

1998 – DR-1203 El Nino - \$43.4 million  
2005 – DR-1577 January Storms - \$41.9 million  
DR-1585 2005 February Winter Storms - \$19.2 million  
2006 – DR-1628 2005/06 Winter Storms - \$12 million  
DR-1646 2006 Spring Storms - \$3.8 million  
2010 – DR-1884 2010 Severe Winter Storms - \$38 million  
DR-1952 December 2010 Statewide Storms - \$11.7 million  
2011 – Spring Storms - \$4.4 million

### Tsunamis

Tsunamis are generated by earthquakes, volcanic eruptions and submarine landslides and usually in this order of frequency.

There are three destructive factors: inundation, wave impact on structures and erosion. Strong Tsunami induced currents lead to erosion of foundations and the collapse of bridges and seawalls. Flotation and drag forces move houses and overturn railroad cars. Considerable damage is caused from floating debris that becomes dangerous projectiles that crash into buildings; break power lines and starts fires. Fires from damaged ships in ports or from ruptured coastal oil storage tanks and refineries can cause damage greater than that inflicted directly by the tsunami. An increasing concern is the potential effect of tsunami draw down, when the receding waters uncover cooling water intakes of nuclear power plants.

- The 1964 Alaska Earthquake, magnitude 8.4, caused areas to be lifted as much as 50 feet in certain areas, while others greatly subsided. In addition, many local tsunamis generated within Prince William Sound created a Pacific-wide tsunami. This caused:
  - o Destruction occurred in southeastern Alaska, in Vancouver Island, Washington, California and Hawaii
  - o Killed 120 people
  - o \$106 million in damages

- o In Crescent City, CA, the waves reached more than 21 feet, destroyed half the waterfront businesses and 11 people were killed
- o Santa Cruz Harbor waves reached 11 feet causing some damage
- o Extensive damage in San Francisco Bay, Marin County marinas and at Noyo Harbor (Fort Bragg), Los Angeles and Long Beach harbors
- o California's losses were estimated to be between \$1.5 and \$2.3 (1964 dollars) million, while Crescent City damage was estimated at over \$7.4 million

## **Seiche**

A seiche is a standing wave on a freshwater lake or in a semi-enclosed harbor on the ocean. The word 'seiche' is often used interchangeably with 'tsunami' and 'tidal wave,' but all three refer to different phenomena.

Seiches can be just as devastating as tsunami waves are in the ocean. What causes seiches? Seiches are caused by earthquakes, landslides, prolonged wind events, meteorite impacts, and gradients between large areas of high and low pressure on either side of the body of water. Anything that can establish resonance on the surface of water in a lake or harbor can cause a seiche. The relatively short cross-shore distances compared to the ocean can cause seiche waves to be reflected back and forth across lakes for hours and hours. As you might imagine, this could be very bad for things and people that call the shores of lakes home.

Lakes in seismically active areas, such as Lake Tahoe in California/Nevada, are significantly at risk from seiches. Geological evidence indicates that the shores of Lake Tahoe may have been hit by seiches and tsunamis as much as 30 feet (10 m) high in prehistoric times, and local researchers have called for the risk to be factored into emergency plans for the region. A 2006 USGS study led by internationally recognized tsunami expert James G. Moore found that a giant landslide in McKinney Bay on Tahoe's west shore dropped several cubic miles of the West Shore 1,500 feet to the bottom of the lake and likely generated enormous seiche waves between 7,000 and 15,000 years ago (Moore et al., 2006).

## **Other Notable Tsunami Events**


- 1700 – Crescent City, Lagoon Creek Orick, Cascadia subduction zone EQ - paleotsunami deposits.
- 1868 – San Francisco, Santa Cruz, Sacramento, 7.0 EQ on Hayward fault – 19 foot surge on shore at Cliff House, wave observed in Sacramento River and water seen rushing up river in Santa Cruz.
- 1883 – Sausalito, Krakatau Volcano – air pressure wave recorded on marigram.
- 2004 – Several coastal areas affected, Sumatran EQ – waves over 1 foot recorded on marigram. \$4.4 billion in total damages
- 2011 – Japan Tsunami
  - o California - \$50.7 million in total damages, \$12.9 million of this for debris removal
  - o Hawaii – Estimated \$30 million in total damages
  - o Oregon – Estimated \$6.6 million in total damages

## Dam Failure

There have been a total of 45 recorded dam failures in California. Failures have occurred for a variety of reasons, the most common failure being overtopping. Other dams have failed due to specific shortcomings in the dam itself or an inadequate assessment of the surrounding geomorphologic characteristics. The first notable dam failure occurred in 1858 in Sierra County, while the most recent failure occurred in 1965. The greatest catastrophe relating to California dam failures was William Mulholland's infamous St. Francis Dam, which failed in 1928. Overall, there have been a least 460 deaths from dam failures in California.

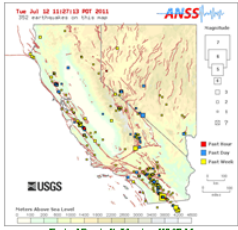
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## Disaster Type Characteristics – Cont'd




### Earthquake Characteristics

- Shockwaves
- Movement along fault lines
- Aftershocks




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### Earthquake Debris


- Construction & demolition materials
- Human remains
- Personal property
- Animal carcasses
- Household hazardous waste
- Metals
- White metals
- Landslide debris
- Electronic debris
- Vehicles/Rvs/Boats



Loma Prieta – October 1989  
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## Earthquakes

- Characteristics:
  - Shockwaves
  - Movement along fault lines
  - Aftershocks
- Although relatively infrequent compared to the other disaster types, the effects are usually devastating
- Most large earthquakes occur on the west coast, but other areas of the country are also prone to earthquakes, less common but more dangerous due to ground accelerations traveling farther and due to ill-prepared structures
- Damages include:
  - Building and infrastructure damage
  - Damage to equipment and personal property from collapsed walls and roofs
  - Sediment from earthquake induced landslides
- USACE estimates that a major earthquake in the LA Basin could generate up to 147 million tons of debris



### Earthquake Debris Removal Costs

- 1994 – DR-1008 Northridge Earthquake, \$40 billion in total damages
- 2003 – DR-1505 San Simeon Earthquake, \$400,000
- 2010 – Humboldt Earthquake, \$3.8 million in total damages, no debris removal reported
- 2010 – DR-1911 Baja Earthquake, \$1.8 million



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## Notable Earthquake Events

- 1994 Northridge Earthquake - \$40 billion in total damages, 57 people died, over 100,000 structures destroyed.
- 2003 San Simeon Earthquake - debris from was minimal. It cost approximately \$400,000 for debris removal from this disaster.
- 2010 Haiti Earthquake - \$14 billion in total damages for this event.
- 2010 – Humboldt Earthquake - \$48 million in total damages, \$12.5 million in debris costs for this event.

**Note:** After the Northridge earthquake, a retired deputy director for a California city department of public works indicated that the city had an excellent earthquake response with the exception that they did not consider the initial debris clearance in their plans (to remove debris out of the roads). The presence of debris significantly impeded the movement of the emergency traffic.


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## Disaster Type Characteristics – Cont'd




### Fire Characteristics

- Ash
- Extensive burn areas
- Secondary impacts often include landslides, erosion of homes, facilities, roads, trees, falling boulders and mudslides from fire fighting efforts or heavy rains after the fire




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### Fire Debris

- Ash
- Charred wood waste
- Foundations, bricks, stucco
- Metals
- Personal property
- Human remains
- Hazardous waste
- Vehicles/RVs/Boats
- Animal carcasses




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## Fire

- Characteristics:
  - o Extensive burn area


- Damages resulting from fires include:
    - o Loss of vegetation
    - o Damaged homes and buildings
    - o Landslides and mudslides on burnt slopes when rains follow the fire
  - Fires can produce a significant amount of debris with the increase of houses in woodlands
  - Secondary Impacts: landslides, erosion of homes, facilities, roads, trees, falling boulders and mudslides from firefighting efforts or heavy rains after the fire.
- 



**Fire  
Debris Removal Costs**

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- 1991 – DR-919 East Bay Hills Fire, \$1.7 billion in total damages
- 2003 – DR-1498 2003 So. Calif. Fires, \$13.2 million
- 2007 – Angora Fire, \$7.2 million
- 2007 – DR-1731 2007 So. CA Fires, \$52.3 million
- 2008 – DR1810 2008 So. CA Fires, \$5.7 million
- 2008 – EM-3287 2008 Mi-Year CA Fires, \$1 million




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### **Notable Fire Events**



- 1991 – East Bay Hills Fire – 354 homes & 456 apartments were destroyed, 25 people died, damages costs were approximately \$1.7 billion.
- 2003 – Southern California Wildfires – 3, 616 structures destroyed, 21 people died, debris costs were approximately \$13.2 million.
- 2007 – Angora Fire – 276 structures destroyed, debris costs were \$7.2 million.
- 2007 – Southern California Fires - 2700 structures destroyed, 9 people died, debris costs approximately \$1.7 million.
- 2008 Southern California Fires – 864 homes destroyed, debris costs approximately \$5.7 million.
- 2008 Mid-Year California Fires (Lightning Complex) – 470 homes destroyed, debris costs approximately \$1 million.


## Disaster Type Characteristics – Cont'd



### Hurricane/Tornado Characteristics


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Hurricane	Tornado
<ul style="list-style-type: none"> <li>High velocity winds</li> <li>Storm surge</li> <li>Wave action</li> <li>Inland flooding</li> </ul>	<ul style="list-style-type: none"> <li>High velocity winds</li> <li>Narrow path</li> <li>Length – up to several miles</li> </ul>
	
California Governor's Office of Emergency Services	Disaster Debris Management <small>2011 Tornado near Chico, CA</small>



### Hurricane/Tornado Debris

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<ul style="list-style-type: none"> <li>Construction &amp; demolition materials</li> <li>Vegetation</li> <li>Metals</li> <li>White metals</li> <li>Household hazardous waste</li> <li>Animal carcasses</li> </ul>	<ul style="list-style-type: none"> <li>Electronic debris</li> <li>Foundations</li> <li>Wood</li> <li>Wallboard</li> <li>Carpeting</li> <li>Vehicles</li> <li>Boats/RVs</li> </ul>
	
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### Hurricane/Tornado

High winds and sudden gusts are the typical cause of damage. This can include, but is not limited to:


- trees
- roofs
- downed power lines

California does not, as a rule, have much experience with hurricanes or tornados but they are by no means rare events. From 1950 through 2004 there were 303 documented tornados in California. In addition, since 1993, there have been 57 waterspouts in the state's coastal waters. California averages six tornados and 5 waterspouts a year. In 2005 there were 20 tornados, including 12 in Sacramento County – more that the Oklahoma City metro area for that year.

While 80% of the state's tornados are weak, (F-0 or F-1), there have been a number of them occurring in populated areas. Los Angeles County ranks as the tornado capitol for the state with 41 tornados, five of these were ranked as an F-2. Orange County had 28 and almost as many waterspouts.



In addition, high winds along coastal areas can result in storm surges and wave action that may cause damage and flooding. This can lead to sediment deposits and debris associated with flooding.

## Disaster Type Characteristics – Cont'd



### Ice/Snow Storm

Characteristics	Debris
<ul style="list-style-type: none"><li>• Restricted access</li><li>• Power outages</li></ul>	<ul style="list-style-type: none"><li>• Vegetative debris</li><li>• Animal carcasses</li></ul>





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### Ice/Snow Storms

- Characteristics:
  - o Restricted access
  - o Power outages
- Ice storms & severe snowstorms often cause similar problems as hurricanes
  - o Significant damage to vegetation
  - o Travel is difficult – roads may be closed as a result of fallen trees and limbs
  - o Power is disrupted and not easily repairable – utility poles and wires may be severely damaged and become debris
  - o Continued cold weather may impede restoration of utilities
  - o Combined with snow accumulation and rapid warming, flooding may occur
- Communities susceptible to ice storms must plan for extensive vegetative debris removal and reduction

## Disaster Type Characteristics – Cont'd

Civil Unrest/Terrorist Acts Characteristics	Civil Unrest/Terrorist Acts Debris
<ul style="list-style-type: none"><li>• Burning structures, cars</li><li>• Broken glass</li><li>• Destroyed buildings</li><li>• Explosions</li><li>• Fires</li><li>• Biological attack</li><li>• Contamination</li><li>• “Dirty” bomb</li></ul>  <p>1992 Los Angeles Riot</p>	<ul style="list-style-type: none"><li>• Personal property</li><li>• Charred wood waste</li><li>• Construction &amp; demolition materials</li><li>• Hazardous waste</li><li>• Contamination – chemical/biological</li><li>• Radiation</li><li>• Metals</li><li>• White goods</li><li>• Electronic debris</li></ul>  <p>2010 NBA Title Riot</p>

### Civil Unrest/Terrorist Act

These two events have similar characteristics and debris, but usually occur for different reasons.

- Civil Unrest Characteristics:
  - o Burning structures, cars
  - o Broken glass
  - o Destroyed buildings
    - ♦ Usually spontaneous
    - ♦ Can quickly get out of hand
    - ♦ Starts at one location and spreads out
    - ♦ Emergency responders often become targets
    - ♦ Crime scene investigation can become necessary
- Terrorist Act Characteristics:
  - o Explosions
  - o Fire
  - o Chemical/Biological Attack
  - o Contamination
  - o “Dirty” Bomb
    - ♦ Little or no warning
    - ♦ Usually high-risk targets (government sites, airports, popular landmarks, utilities, cyber-space, postal service, nuclear plants)
    - ♦ Emergency responders often become targets
    - ♦ Crime scene investigation can become necessary
- Secondary Impacts: Flooding from fire fighting efforts


### Notable Civil Unrest Events

- 1992 Los Angeles Civil Unrest - three days of disorder killed 55 people, injured almost 2,000, led to 7,000 arrests, and caused nearly \$1 billion in property damage, including the burnings of nearly 4,000 buildings.




- 2010 Los Angeles NBA Title Riot –Hundreds of police were deployed around the Staples Center but the riot still happened. Firefighters responded to 37 incidents near the Staples Center following the game. Costs were reported to be \$1.8 million for fire, medical and police responses.
- 

## Disaster Type Characteristics – Cont'd



### Volcano Characteristics


Characteristics	Debris
• Ash	• Ash
• Lava	• Charred wood waste
• Pyroclastic flows	• Foundations
• Lahars	• Bricks
• Damaged structures	• Metals
• Downed trees	• Personal property
• Damaged roads	




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### Volcano


- Characteristics:
    - o Ash
    - o Molten Rock
    - o Damaged Structure
    - o Downed Trees
  - Secondary impacts: Earthquakes, landslides, erosion of homes, facilities, roads, trees, falling boulders and mudslides from fire fighting efforts or heavy rains after the fires
- 



### California Volcanoes



- 23 separate volcanic areas in the state, over 500 volcanic vents
- Cascade Range volcanoes are known as explosive volcanoes
- Three most watched volcanoes in state:
  - Long Valley Caldera (#2 in nation)
  - Mt. Lassen
  - Mt. Shasta



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### California Volcanoes

Within the State of California, 23 separate volcanic areas and more than 500 volcanic vents have been identified. California volcanoes demonstrate great variety in their types and in their geologic settings; potential volcanic hazards within the State vary accordingly. Therefore it is safe to say, that a volcano in California will erupt again.

In 1973, a very conservative estimate indicated that losses in California due to volcanic eruptions could amount to \$50 million. The results of the 1980 Mount St. Helens eruptions, however, suggest that far greater losses are likely from even small future eruptions in California. Eruptions of Mount St. Helens in May and June 1980, that were small in volume relative to possible future events in California, resulted in estimated short-term losses to the economy of Washington State of \$970 million.

Debris from a volcano is often the cause of damage in and of itself. A debris avalanche is a sudden and very rapid movement of a mass of rock and soil mobilized by gravity. The debris flows in a dry or wet state and commonly originates in massive rockslides. A debris avalanche that occurred at Mount Shasta between about 300,000 and 360,000 years ago traveled more than 32 miles from the summit of the volcano, covered more than 243 square miles, and had a volume of at least 56,700 cubic yards. The Mount Shasta debris-avalanche deposit covers roughly 10 times the volume of the Mount St. Helens avalanche deposit.

### **Active Volcanic Areas**

Mount Shasta – Mount Shasta has erupted, on the average, at least once per 800 years during the last 10,000 years, and about once per 600 years during the last 4,500 years. The last known eruption occurred about 200 years ago. Most of these eruptions produced large mudflows, many of which reached more than 30 miles from Mount Shasta. Future eruptions like those of the past could endanger the communities of Weed, Mount Shasta, McCloud, and Dunsmuir, located at or near the base of Mount Shasta.

Lassen Peak – 1914-1917: a series of small explosions that began on May 30, 1914, was followed 12 months later by extrusion of lava from the summit and a destructive pyroclastic flow and lahars on May 21, 1915. The fall of fine ash was reported as far away as Elko Nevada, more than 800 miles east of Lassen Peak. Intermittent eruptions of variable intensity continued until about the middle of 1917.

Areas of high relief within the Lassen volcanic center such as the Lassen Peak dome could also collapse and generate rock falls and/or debris avalanches that could endanger areas within about 16 miles of the source.

Long Valley Caldera - All but three of the 20 or so eruptions over the past 5,000 years have been explosive in nature. Those three were of the effusive, Hawaiian type (the Red Cones eruptions south of Mammoth Mountain about 5,000 year ago, the Negit Island eruption about 2,000 years ago, and the Paoha Island eruption just 250 years ago). All have been small to moderate in scale. In 1990, it was noted that trees in an area of about 170 acres have been killed by carbon dioxide (CO<sub>2</sub>) emissions. Today concentrations of CO<sub>2</sub> are so high, that children and pets should not enter any natural collapse pits nor dig up loose material from the pits. Also in winter, CO<sub>2</sub> levels can develop in tree wells, around buildings and immediately below the snow in these high emission areas.

Clear Lake and Sonoma volcanics - Are the less-than-5-million-year old components of a northwesterly youngling line of volcanic. All these volcanics lie within the San Andreas fault system, which appears to have provided magma access to the surface. These volcanics are among the closest to a subduction plate boundary of any in the world and will repay closer tectonic investigation. Apparently leakage of basalts along the San Andreas Fault system has occurred repeatedly.

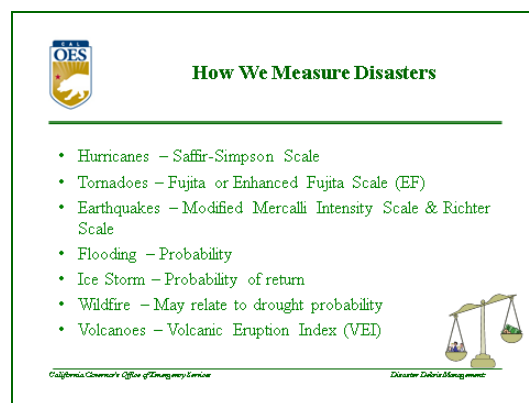
Medicine Lake - A sleeping giant, is the largest volcano in the Cascade Range. Filling up the entire southern skyline, it has been erupting off and on for half a million years. The eruptions were gentle rather

than explosive like Mount St. Helens, coating the volcano's sides with flow after flow of basaltic lava. This created a shield-shaped mountain approximately 150 miles around the base and 7900 feet high. Medicine Lake is part of the old caldera, a bowl-shaped depression in the mountain. It is believed that the Medicine Lake volcano is unique, having many small magma chambers rather than one large one.

Coso Volcanic Field - It is well known as a geothermal area. A multi-disciplinary program of geothermal assessment carried out in the 1970s defined a potential resource of 650 megawatts electric with a nominal life span of 30 years. Commercial development beginning in the 1980's resulted in the startup of a geothermal steam-driven 3-MW electric power plant in 1987. Highway 395 crosses the west side of Coso volcanic field at the village of Little Lake, approximately 34 kilometers north of Inyokern, California. Most of the field is a few to several kilometers to the east, within the China Lake Naval Weapons Center.

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### Disaster Intensity Scales



Disaster Intensity Scales have been developed for hurricanes, tornadoes and earthquakes that relate the intensity of an event to the anticipated type and magnitude of damage.

### Saffir-Simpson Hurricane Scale

The Saffir-Simpson Hurricane Scale is a 1-5 rating based on the hurricane's present intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region. All winds are using the U.S. 1-minute average.

- Category 1 hurricane has lighter winds compared to storms in higher categories. A Category 4 hurricane would have winds between 131 and 155 mph and, on average, would usually expected to cause 100 times the damage of a Category 1 storm.
- Depending on the circumstances, less intense storms may still be strong enough to produce damage, particularly in areas that have not prepared in advance.
- Hurricane-force winds can easily destroy poorly constructed buildings and mobile homes. Debris such as signs, roofing material, and small items left outside become flying missiles in hurricanes. Extensive damage to trees, towers, water and underground utility lines (from uprooted trees), and fallen poles cause considerable disruption.
- High-rise buildings are also vulnerable to hurricane-force winds, particularly at the higher levels since wind speed tends to increase with height. It is not uncommon for high-rise buildings to suffer a great

deal of damage due to windows being blown out. Consequently, the areas around these buildings can be very dangerous.

### **Fujita Tornado Scale**

The Fujita Tornado Scale is a scale of wind *damage* intensity in which wind speeds are inferred from an analysis of the damage from the wind.

- Tornadoes are one of nature's most violent storms. In an average year, about 1,000 tornadoes are reported across the United States, resulting in 80 deaths and over 1,500 injuries. A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long.
- Tornadoes come in all shapes and sizes and can occur anywhere in the U.S. at any time of the year. In the southern states, peak tornado season is March through May, while peak months in the northern states are during the summer.
- Most tornadoes spawned by tropical cyclones are relatively weak (F0-F1), but more than 20% have been F2 or F3 and have caused considerable damage. Ten percent of all hurricane deaths are caused by tornadoes.

### **Enhanced Fujita Scale**

In 1992, Dr. T. Theodore Fujita recognized that improvement was necessary. He updated the Fujita Tornado Scale to include an estimate of f-scale damage, thus the creation of the EF Scale.

The Enhanced F-scale still is a set of wind estimates (not measurements) based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to the 28 indicators. These estimates vary with height and exposure. **Important:** The 3-second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, and "one minute mile" speed.

### **Modified Mercalli Intensity Scale**

The Mercalli Scale is based on observable earthquake damage. From a scientific standpoint, the Richter scale is based on seismic records while the Mercalli is based on observable data, which can be subjective. Thus, the Richter scale is considered scientifically more objective and therefore more accurate. For example a level I-V on the Mercalli scale would represent a small amount of observable damage. At this level doors would rattle, dishes break and weak or poor plaster would crack. As the level rises toward the larger numbers, the amount of damage increases considerably.

The Mercalli Scale is a scale of 12 increasing levels of intensity and ranges from imperceptible to catastrophic destruction. It is an arbitrary ranking (not mathematical) based on observed effects after an earthquake has occurred. Lower numbers generally deal with the manner in which people feel the earthquake. Higher numbers are based upon observed structural damage.

## **Richter Scale**

The Richter Scale is not used to express damage but to express energy release. It is a mathematical equation that is determined from the logarithm of the amplitude of waves recorded by seismographs. The magnitude is then expressed in whole numbers and decimal fractions. Each whole number step in the scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number.

## **Volcanic Explosivity Index**

The Volcanic Explosivity Index, or VEI, was proposed in 1982 as a way to describe the relative size or magnitude of explosive volcanic eruptions. It is a 0-to-8 index of increasing explosivity. Each increase in number represents an increase around a factor of ten. The VEI uses several factors to assign a number, including volume of erupted pyroclastic material (for example, ash fall, pyroclastic flows, and other ejecta), height of eruption column, duration in hours, and qualitative descriptive terms.

Photo: In the figure, the volumes of several past explosive eruptions and the corresponding VEI are shown. Numbers in parentheses represent total volume of erupted pyroclastic material (tephra, volcanic ash, and pyroclastic flows) for selected eruptions; the volumes are for un-compacted deposits. Each step increase represents a tenfold increase in the volume of erupted pyroclastic material.

A series of small to moderate explosive eruptions from Mono-Inyo Craters Volcanic Chain, California, during the past 5,000 years ranged from VEI of 1 to 3. The 18 May 1980 eruption of Mount St. Helens was a VEI 5 with an erupted volume of about 1 km<sup>3</sup>. The 1991 eruption of Mount Pinatubo had a volume of about 10 km<sup>3</sup> and a VEI of 5 to 6. The 1815 eruption of Tambora, Indonesia, had a VEI of 7 and a volume in excess of 100 km<sup>3</sup>. The eruption of Long Valley Caldera about 760,000 years ago had a VEI of 7 and a volume of 600 km<sup>3</sup> of material. The largest explosive eruption on the figure occurred at Yellowstone about 600,000 years ago with a VEI of 8 and a volume of about 1,000 km<sup>3</sup> of material.

### Did you know?

- The VEI has some similarities to the Richter magnitude scale used to measure earthquakes. It has a simple numerical index of increasing magnitude of explosivity, with each interval representing an increase of about a factor of 10 in the volume of erupted tephra.
- There are no known explosive events with a VEI larger than 8.
- Volcanologists developed the VEI in order to help estimate the climatic impact of volcanic eruptions. They soon learned, however, that the amount of sulfur dioxide gas injected high into the atmosphere (which is not necessarily related to the size of an eruption) was a critical factor in determining the climatic impact of volcanic eruptions. Today, the VEI is primarily used to estimate the relative size of an explosive eruption.
- Large explosive eruptions occur much less frequently than small ones. Through 1994, the record of volcanic eruptions in the past 10,000 years maintained by the Global Volcanism Program of the Smithsonian Institution shows that there have been 4 eruptions with a VEI of 7, 39 of VEI 6, 84 of VEI 5, 278 of VEI 4, 868 of VEI 3, and 3,477 explosive eruptions of VEI 2.

## Other Disaster Types


Other disaster types also have some measure of intensity:

- Flooding: Normally identified by probability. For example, reference to a 100-year flood represents a 1% probability of occurring in any one year.
  - Ice Storms: Less defined but some areas do maintain records on return periods.
  - Wildfires: Difficult to affix a scale but some relate wildfire potential to drought probability or available fuel.
- 

## Debris Types and Issues

Debris Types – Vegetation & Sediments	
Vegetation	Sediment
<ul style="list-style-type: none"><li>• Leaves</li><li>• Branches</li><li>• Limbs</li><li>• Uprooted trees &amp; shrubs</li></ul>	<ul style="list-style-type: none"><li>• Mud</li><li>• Dirt</li><li>• Rocks</li><li>• Sand</li><li>• Sandbags</li></ul>

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Disaster Debris Management

As indicated earlier, many of the debris types will be generated by more than one disaster type, however, the magnitude and mix of the debris will vary between disasters.

## Vegetation

- Trees.
- Brush.
- Limbs.
- Vegetative debris will be generated from most disaster types.
  - o Hurricanes and Tornadoes - significant quantities.
  - o Floods.
  - o Wildfires.
  - o Ice Storms – some of the largest amounts of vegetative debris come from ice storms.
- Vegetative debris quantities.
  - o May run as high as 70% of the total amount of disaster debris – as with Hurricane Floyd in North Carolina in 1999.
- Vegetative debris will be found both on public and private property, and will be found within streets, often blocking vehicle traffic.
  - o Debris within streets must be cleared quickly to allow movement of emergency vehicles.



## Sediment

- Sediment and sand will result primarily from flooding events (floods and hurricanes).
  - o Areas with unconsolidated or loose soil material may become almost a river of sediment during flood conditions.
  - o Sediment flow conditions can be highly destructive and dangerous.
- Wildfires and earthquakes may also generate landslides and mudslides, resulting in the deposits of sand and rocks.
- Sediment flow combined with high velocity floodwater may cause extensive structural damage – both the sediment and structural debris will require disposal.

**Note:** Sandbags (Sediment) used to protect against flooding remain after floods recede must be handled cautiously – they can be contaminated with pollutants from flooded sewage treatment plants, pesticides, herbicides, chemicals and hydrocarbons. The sandbags must be tested and disposed of properly.

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## Debris Types and Issues – Cont'd

 <b>Debris Types – Construction &amp; Demolition</b>			
Acrylic	Drywall	Mirrors	Wood
Asbestos	Electrical	Tiles	Vinyl
Asphalt	Glass	Pipes	
Blinds	Insulation	Plastics	
Bricks	Light bulbs	Rubber	
Carpets	Masonry	Rebar	
Concrete	Metals	Utility poles	

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## Construction and Demolition (C&D)

C&D debris is generated by damaged structures and can be present in most types of disasters to varying degrees (hurricanes, tornadoes, floods and earthquakes).

- C&D materials may include both building construction materials and contents (office equipment, personal property, etc.).
- Some C&D materials can be recycled but most will require disposal.
- The structure's use and building materials must be evaluated to consider the potential presence of asbestos and other potentially hazardous materials.


## Utility Systems

- In addition to building damage, construction debris may include utility systems such as utility poles, wiring, conduits and other items from power, telephone, Cable TV and other utilities.
  - o These damages should be expected in all types of disasters, with a significant concentration from ice storms.



- o It is necessary to coordinate closely with appropriate utility companies to define jurisdictional responsibilities and to encourage cooperation to expedite recovery.
  - Charred wood and construction materials are a significant portion of wildfire debris, and may also result from earthquake or other disaster induced fires.
  - Charred materials may require different handling and disposal.
    - o Resulting materials are often a mix of the building construction materials and contents, including asbestos and other hazardous material, but their presence may not be readily identifiable.
    - o Burned asphalt often is included in this mix.
    - o Must look at the method of disposal to determine how various possible components of this mix may be accounted for and paid for.
  - Even if removal is the responsibility of the private landowner, the local community must consider its disposal.
  - Destroyed homes will result in significant quantities of debris – C&D and contents. Building materials blown into roadways and yards may include lumber, shingles and other building materials.
  - Local ordinances should require homeowners to have their private contractors haul any debris resulting from the demolition and/or rebuilding process to be taken directly to the landfill and should be paid for from insurance proceeds, when available.
  - This will result in large quantities of mixed debris.
    - o Debris becomes mixed by:
      - ♦ Uncontrolled collection and disposal.
      - ♦ Disaster effects such as high winds from hurricanes and tornadoes.
    - o Roadside debris piles often contain a mixture of debris types.
    - o Separation of the mixed debris is often not cost effective. Most often the debris is taken directly to the landfill.
  - The metal frames, light metal porches and outbuildings may be suitable for metal recycling efforts.
- 


### **Debris Types and Issues – Cont'd**



**Debris Types – Personal Property**

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Beds	Lamps
Mattresses	Sofas
Desks	Artworks
Telephones	Books
Typewriters	Clothing
Chairs	Ceramics
Chests	Furniture



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Disaster Debris Management



#### **Personal Property**

- Household furnishings and personal effects will become debris as a result of many disaster types.
  - o Hurricanes and Tornadoes from wind damaged residences.
  - o Flood effects after the water recede.
  - o Earthquakes from damaged structures.
  - o Wildfires from burnt homes and structures.



- If residents do not have sufficient time to move contents, as would be the case in tornadoes, flash floods and earthquakes, the quantities of personal effects will be significant.
  - Quantities increase when roofs are damaged during rain events.
  - Household furnishings normally makeup the second wave of debris that will come to the right-of-way.
  - Rugs, furniture, and mattresses should be treated as mixed debris and taken directly to a landfill.
  - White goods, such as refrigerators, stoves, washers, dryers, etc. should be segregated and recycled if possible. Care must be exercised to ensure that Freon is removed from cooling units by a certified air-conditioning technician.
  - Removal of vehicles and boats should be the owner's responsibility to remove and dispose of.
- 

### **Debris Types and Issues – Cont'd**

 <b>Debris Types – Metals</b>	
<b>White Metal (Appliances)</b>	<b>Metals</b>
<ul style="list-style-type: none"><li>• Washing machines</li><li>• Dryers</li><li>• Refrigerators</li><li>• Stoves</li><li>• Hot water heaters</li><li>• Furnaces</li></ul>	<ul style="list-style-type: none"><li>• Frames</li><li>• Metal porches</li><li>• Sheds</li><li>• Roofing</li><li>• Siding</li><li>• Fencing</li><li>• Propane tanks</li></ul> 
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<small>Disaster Debris Management</small>	

#### **White Metals (Appliances)**

White metals may include:

- Refrigerators.
- Freezers.
- Washers.
- Dryers.
- Care must be exercised to ensure that Freon is removed from cooling units of refrigerators, freezers and air conditioners; experts should do this.

#### **Metals**

- Metals debris may include:
  - o Roofing.
  - o Mobile homes.
- Some metals might be suitable for recycling.

## Debris Types and Issues – Cont'd

 <b>Debris Types – Hazardous Waste</b>	
Household	Other
<ul style="list-style-type: none"><li>• Cleaning agents</li><li>• Oils</li><li>• Paints</li><li>• Fertilizers</li><li>• Pesticides</li><li>• Solvents</li><li>• Ammunition</li></ul> 	<ul style="list-style-type: none"><li>• Radiological material</li><li>• Biological toxins</li><li>• Chemicals</li><li>• Animal carcasses</li><li>• Asbestos</li></ul> 

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### Household Hazardous Waste

Household hazardous waste (HHW) is usually the stuff that's kept under the sink, in the garage and/or shed.

- HHW can result for any type of disaster that results in damage to a residence.
- HHW may be mixed in with personal property debris.
- Every effort should be made to segregate HHW from the debris stream at the curbside, as these materials require special handling and disposal.
- HHW includes such items as:
  - o Paint.
  - o Solvents.
  - o Cleaning supplies.
  - o Insecticides.
  - o Pool chemicals.
  - o Propane tanks.
  - o Gasoline.
  - o Oils.

### Hazardous Waste

- Use experts for removal, transportation & disposal.

### Human Remains

The remains of many people are unaccounted for and many are still trapped in the rubble. Recovery of human remains in a dignified and respectful manner must be integrated with the debris stream processing. Remains should be recovered at the rubble site to the maximum extent practical. However, human remains may be encountered either at the disaster debris collection point or at a debris processing / staging site where transported debris is separated and processed. It should be noted that animal remains pose similar health hazards, and that the same safety and health requirements should be applied as appropriate when handling animal remains. More information can be found in Appendix A – USACE Human Remains handling.

## **Crime Scene Debris Removal**

It is essential for public safety, and for purposes of crime scene investigation that the site of a terrorist incident is secured during the initial response, and maintained during the recovery operation. Local governments must establish methods to be utilized at a crime scene that focus on law enforcement concerns such as site security and the safeguarding of evidence. The early response phase of a critical incident must prioritize public safety and responder safety. The scene and the evidentiary possibilities must be safeguarded while simultaneously protecting the health and safety to the public and to the first responders.


See Appendix B for a document prepared by the federal Department of Homeland Security. It was created from interviews conducted with personnel who responded to the Alfred P. Murrah Federal Building Attack, including FBI, Oklahoma City, OK Fire Department, and State of Oklahoma Division of Emergency Management. March 9-10, 2005. While the emphasis of this section is focused on a Weapon of Mass Destruction (WMD) incident, it is applicable to other terrorist events where debris is part of a criminal investigation.

## **Animal Carcasses**

It should be noted that animal remains pose similar health hazards found in the recovery of human remains, and that the same safety and health requirements should be applied as appropriate when handling animal remains.


- Often times, a storm will cause a farmer to not have access to the animals, which can cause additional deaths.
- Farmers and/or animal owners should be responsible for the disposal of their animals, but when large numbers of animals are affected, it may be beyond the means of the farmer to properly dispose of the animals.
- Additionally, particularly in floods, animals may have washed into trees and onto public and private property. To determine ownership of these animals would often be impossible.
- In large-scale events, wild animals could also be a problem for collection as well as disposal.
- Disposal of animals presents an environmental/health issue.
  - o The health and safety of those doing the cleanup as well as the citizens at large must be considered.
  - o Long-term environmental impacts of its disposal must be considered.
  - o The traditional method for disposal is burying. However, for large numbers, this may present a health issue. Composting and incineration are also effective means of disposal, but must be evaluated against environmental regulations. (See CalRecycle website for further information.)

## Debris Types and Issues – Cont'd



### Debris Types – Electronic Debris

- Televisions
- Computer screens
- Hard drives
- Printers
- Fax machines
- Cell phones
- Switch boards
- Batteries



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### Electronic Debris

Electronic debris will result from many disaster types. In the past, batteries from radios, cell phones, flashlights, etc., were tossed into the waste stream without pause. Today, this and other types of electronic debris are pulled out and disposed separately. In fact, many landfills charge an additional fee for this debris type.

- If residents do not have sufficient time to move, as would be the case in of fires, earthquakes, flooding, tornadoes, the quantities of electronic debris could be significant.
- Is usually mixed in with personal property and C&D debris.
- Care should be exercised with this debris as some building materials are hazardous Electronic debris should be separated and disposed of in designated landfills.


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## Critical Debris Issues




### Critical Debris Issues

- Type of potential disasters
- How much and what type of debris
- How it will be:
  - collected
  - transported
  - stored
  - reduced
  - disposed




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### Critical Debris Issues – Cont'd

- Identification of responsible department/agencies
- Capabilities of in-house resources
- Identification of work to be contracted
- Private property debris removal
- Documentation
- Identification of applicable environmental and historic laws
- Requirements for state/federal funding



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To effectively manage debris activities, it is important to identify and address critical debris issues, including:

- What type of disasters should be planned for in this community?
- How much and what types of debris can be generated in these events?
- How will the material be collected, transported, stored, reduced and disposed of?

Additionally, the community must identify how the work will be organized, performed and managed.

- Identify agencies available to assist in the debris efforts and what their responsibilities will be.
- Identify the capabilities of in-house resources and how they can best be used.
- Identify the types of work that should be contracted.
- What types of contracts will be most appropriate for the type of work?
  - Identify the Federal, State and local environmental and historic preservation laws that might apply to the anticipated work.
  - Identify the types of documentation that may be required to support state/federal funding.
- Private property debris removal
- Documentation
  - Start immediately
  - Who will be responsible?
- Consider state/federal requirements for public assistance funding.

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# **ELIGIBILITY & REASONABLE COSTS**

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## **Eligibility & Reasonable Costs**



Large debris generating events often result in a State and/or Presidential declaration of a major disaster wherein Cal OES/FEMA may provide supplemental assistance for eligible debris related activities to those communities declared in the disaster.

Local Governments should be familiar with state and federal eligibility and reasonable costs guidelines during the planning stage in order to plan for critical issues such as contracting, monitoring and preparing appropriate documentation to support requests for funding.

Although there is not a requirement for communities to consider state and federal guidelines in the Debris Management Plans, a lack of knowledge of state and federal requirements has led communities to loss of funding for debris removal operations.

This section is intended to provide a general introduction to eligibility issues. It is not intended to cover all circumstances that may be encountered in the field. The tools and resources covered in this unit will assist the community in locating applicable laws and regulations relative to situations that may arise.

Therefore, this section provides a discussion of:

- The resources and tools available for assessing debris-related eligibility issues;
- Eligibility issues for various debris activities;
- Distinctions between private and public property; and
- Activities where participants assess eligibility and reasonable cost issues and incorporate issues into debris planning.

## Regulations



### State

The California Disaster Assistance Act (CDAA) governs the eligibility rules for disaster debris removal within the state.

- **CDAA, Section 2920 - Emergency Work**
  - o Emergency work to save lives, protect public health and safety, and to protect property in an area proclaimed to be in a state of emergency.
- **CDAA, Section 2930 - Emergency Protective Measures**
  - o Actions taken to remove and/or reduce immediate threats to public property, or to private property when in the public interest.
- **CDAA, Section 2925 – Debris Removal**
  - a) General Eligibility;
    - (1) Debris removal from publicly and privately-owned lands and waters, undertaken in response to a state of emergency proclamation by the Governor is eligible for state financial assistance; and,
    - (2) For purposes of this program, the removal of debris from private property shall be reimbursed only when there is an immediate threat to public health and safety. In a case where reimbursement for debris removal from private property is authorized by the agency secretary, the following requirements shall apply, unless waived in part or full by the agency secretary:
      - (A) The property owner must remove all disaster-related debris from the property to the curb or public right-of-way;
      - (B) The local agency must obtain a signed statement from the property owner to the effect that the property owner does not have insurance covering the removal of the disaster-related debris; and,
      - (C) The local agency must have a signed statement from the property owner giving the local agency the right of entry and absolving the local agency and the state of any liability relative to removal.

### Federal

FEMA and the Public Assistance Program are governed by the law defined in the Stafford Act and regulations provided in Title 44 of Code of Federal Regulations (44 CFR). These laws and regulations provide the criteria for determining eligibility of debris activities.

- **Stafford Act**

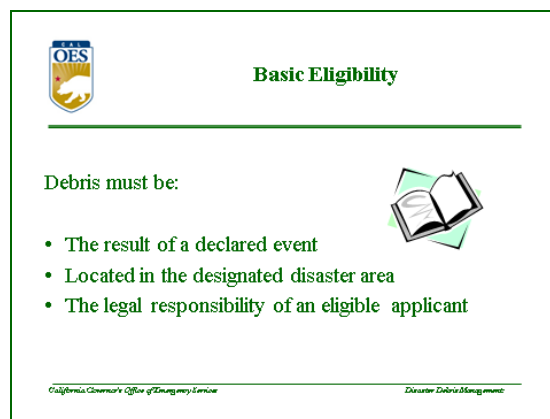
- Section 403 Essential Assistance;
  - Basic eligibility for debris removal, clearance of roads, demolition and reduction of immediate threats are all included in this section.
- Section 407 Debris Removal;
  - Debris and wreckage removal from public and private property.
- Section 502 Federal Emergency Assistance authorizes Direct Federal Aid for debris removal activities.

- **Regulations 44CFR Part 206**

- 206.224 Debris Removal.
- Category A Criteria.
  - Criteria for debris removal from private property, including large lots.
- 206.225 Emergency Work.
- Category B Criteria.
  - Emergency Protective Measures criteria used in determining eligibility for demolition. Cost effective measures must be used.

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### **Basic Eligibility**



In addition to the debris removal regulations, to be eligible for assistance, activities must satisfy the general work eligibility regulations.

An item of work must:

- Be required as the result of the major disaster event,
- Be located within a designated disaster area, and
- Be the legal responsibility of an eligible applicant.

*Public Interest* is defined as work necessary to:

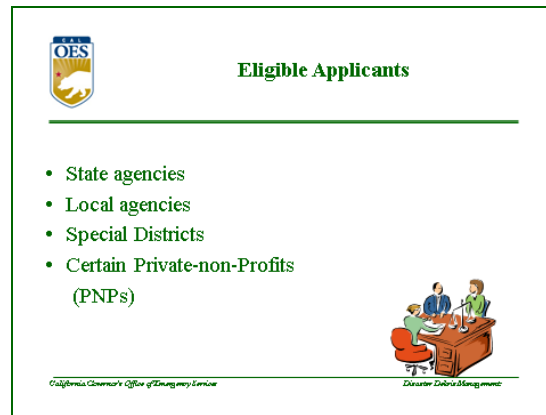
- Eliminate immediate threats to life, public health, and safety; or
- Eliminate immediate threats of significant damage to improved public or private property; or

The debris must pose an immediate threat. Debris that would not otherwise result in harm is not eligible for removal.

The eligibility of the activities must address public health and safety. Close attention must be paid to whether or not these conditions are met, especially when considering debris removal from private property.

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### Applicant Eligibility



#### State - CDAA § 2900

- Eligible applicant means any local agency (city, city & county, county, county office of education, community college district, school district, or special district).

#### Federal - 44 CFR 206

- Debris removal activities are eligible for both public and Private Nonprofit (PNP) applicants.


There are four types of eligible applicants for public assistance. If an entity meets the requirements of one of the types, the Applicant may be eligible to receive Federal disaster assistance.

- **State Government Agencies**
- **Local Governments and Special Districts**  
Any county, city, village, town, district, or other political subdivision of any State and includes any rural community, unincorporated town or village, or other public entity for which an application for assistance is made by a State or political subdivision thereof.
- Other State and local political subdivisions may be eligible if they are formed in accordance with State law as a separate entity and have taxing authority. These include, but are not limited to, school districts, irrigation districts, fire districts, and utility districts.
- **Private Non-Profit Organizations**  
Private Nonprofit organizations or institutions that own or operate facilities that are open to the general public and that provide certain services otherwise performed by a government agency. These services include:
  - *Education*  
Colleges and universities  
Parochial and other private schools
  - *Utility*  
Systems of energy, communication, water supply, sewage collection and treatment, or other similar public service facilities.

- *Emergency*  
Fire protection, ambulance, rescue, and similar emergency services.
- *Medical*  
Hospital, outpatient facility, rehabilitation facility, or facility for long-term care for mental or physical injury or disease.
- *Custodial Care*  
Homes for the elderly and similar facilities that provide institutional care for persons who require close supervision, but do not require day-to-day medical care.
- *Other Essential Governmental Services*  
Museums, zoos, community centers, libraries, homeless shelters, senior citizen centers, rehabilitation facilities, shelter workshops and facilities that provide health and safety services of a governmental nature. Health and safety services are essential services that are commonly provided by all local governments and directly affect the health and safety of individuals. Low-income housing, alcohol and drug rehabilitation, programs for battered spouses, transportation to medical facilities, and food programs are examples of health services.
- **Federally recognized Native American Indian Tribes, Alaskan Native Tribal Governments, Alaskan Native village organizations or authorized tribal organizations and Alaskan Native village organizations.**


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## Eligibility




### Eligible Facilities

- Buildings
- Utilities
- Water control facilities
- Parks & recreation areas
- Federal-Aid System Roads\*  
(\*See FEMA Recovery Fact Sheet 9580.214)
- Waterways#  
(\*See FEMA Recovery Policy RP9523.5)




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### Eligible Work

- Eliminates immediate threat to lives and public health & safety
- Eliminates immediate threats of significant damage to improved public or private property
- Ensures economic recovery of the affected community to the benefit of the community at large  
(federal disasters only – Katrina sized event)



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Under a federal declaration, debris can be removed when necessary to ensure economic recovery of the *community-at-large*. This is generally defined as removing debris from commercial areas to expedite economic recovery. It does not mean general debris removal from private property.

**Note:** *The terms immediate threat, public health and community-at-large are very important in assessing eligibility. This is eligible only under a federal declaration and is not an option under CDAA.*

## Roads

In large debris generating disasters, much of the debris that requires clearance and possible removal in the early stages of the event is that deposited on roadways, thus requiring removal for emergency access.

In general, debris on public property that must be removed to allow safe operation of governmental functions or to alleviate an immediate threat is eligible.

#### Public Roads

- Generally, debris that is blocking streets and highways is considered a threat to public health and safety because it blocks passage of emergency vehicles or it blocks access to emergency facilities such as hospitals.
- Debris may be removed from travel lanes, shoulders, roadside ditches and drainage features, and maintained rights-of-way.

#### **Federal-Aid Systems Roads**

- Federal-Aid System Roads are under the authority of the Federal Highway Administration (FHWA). However, as of October 1, 2012, the FHWA Emergency Relief (ER) Program will not provide assistance for debris removal on Federal-aid highways in jurisdictions designated for FEMA Public Assistance. (FEMA Recovery Fact Sheet 9580.214)
- Any debris removal funded by FEMA must meet the eligibility, procurement and documentation requirements established in the Stafford Act (See 44 CFR Part 206).
- This change applies only to debris removal and does not affect any other categories of PA work. Permanent work on Federal-aid highways is still not eligible for PA funding.

#### **Water Control Facilities**

- Water control facilities naturally collect debris and sediment on a regular basis, requiring maintenance of the facilities to maintain their function.
- Therefore, when evaluating debris removal eligibility from such facilities, it is necessary for the applicant to provide documentation to demonstrate the portion of the existing debris that was generated by the disaster. Evidence of a formal maintenance program and records of the program being implemented is often required.
- Although the applicant may choose to remove all debris, pre-disaster and disaster-related, only the disaster-related debris quantities are eligible, and generally, only that portion that is necessary to remove the threat.

#### **Levees**

- Debris removal from permanent levees is eligible for public health and safety, even from levees under authority of the USACE and NRCS.
- Where temporary levees have been constructed as an emergency protective measure, removal of them is eligible only to protect public health and safety or to protect improved public or private property. This may be necessary to open roads.

#### **Dams and Reservoirs**

- Removal of debris from dams may be eligible – for example, if debris is blocking a spillway or intake structures.
- Removal of disaster-related debris from reservoirs may be eligible if evidence is provided that the reservoirs were regularly cleaned prior to the disaster and the pre-disaster level can be established.

## **Debris Basins, Drainage/Irrigation Channels**

- Removal of silt, mud and other debris from lined and unlined basins and engineered channels may be eligible if the pre-disaster level of debris can be determined. Such facilities must have a regular schedule of debris removal.

## **Natural Streams**

- CDAA does not fund work done in natural streams, only for man-made facilities.
- Under 44 CFR 206, eligible debris removal from a stream is limited to the minimum effort required to eliminate an immediate threat to life, public health, and safety, or debris that is immediately up/down stream of and in close proximity to improved property.
- Debris removal from a stream by an applicant for which another Federal agency has specific authority, is ineligible under the Public Assistance Program, except for limited debris removal that is:
  - a. Reasonably necessary to eliminate an immediate threat to life, public health and safety; OR
  - b. Located immediately up/down stream of or in close proximity to improved property and which poses an immediate threat of significant damage to that property; AND
  - c. The other Federal agency is not providing assistance for the activity.
- The removal of trees still rooted to an embankment may be eligible if:
  - a. The tree is partially or wholly floating or submerged in the waterway; and
  - b. The tree presents an immediate threat to life, public health, and safety; and
  - c. Another Federal agency does not have specific authority to fund or perform the work.

**Note:** *In such cases, FEMA may determine that the cost to cut the floating or submerged portion of the tree at the water's edge is eligible.*

## **Buildings**

- Removal of mud and silt, or similar disaster-related debris in and on buildings is eligible.
- If furnishings from public buildings are damaged to the point where they become debris, they are eligible for removal and disposal if brought to the curb.
- Sometimes, public facilities are damaged to the point that demolition is necessary for public health and safety.
  - o State and Federal policy on demolition must be reviewed for these situations.
- Insurance, also discussed later in this unit, is a large consideration in building debris removal and demolition activities.
- Debris resulting from permanent repair activities is not eligible as Category A, but would be eligible under the permanent repair efforts.


## **Utilities**

- Generally, debris removal from eligible utilities also will be eligible.
- Some materials may be salvageable.
- Environmental issues may be present – such as PCB filled transformers.

## **Parks and Recreation Areas**


- The removal of debris from parks and recreational areas used by the public is eligible when it affects public health or safety or proper utilization of such facilities.
  - Damage to publicly owned marinas could include abandoned sunken boats and other debris that may impede navigation.
    - o Identified navigation hazards are eligible for removal.
    - o Coordination must be made between the US Coast Guard, State Marine Patrol, local government agencies, legal counsel, and contractors specializing in marine salvage operations, commercial divers and certified surveyors to ensure the hazards are removed safely and efficiently.
  - Debris removal from wilderness or unused areas is not eligible.
  - Disaster-related debris on beaches is eligible if the beaches are consistently used for public purposes and a health and safety hazard exists.
  - Recreational facilities are not eligible PNP facilities. Therefore, debris would only be eligible in accordance with the eligibility criteria for private property (discussed later in this unit).
- 

## **Private Property Debris Removal**



### Private Property Debris Removal

- **Authority**  
CDA Title 19, Section 2925(2)  
44 CFR 206.224(b)
- **Eligible** only if there is an immediate threat
- Applicants & property owners are aware of responsibilities
- Has been approved by State and/or FEMA before work begins

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Reimbursement for removal of debris from private property can only be performed under specific circumstances and only with prior state and/or federal approval.

## **State Regulations for Private Property Debris Removal**

Under state regulations, debris removal from private property is reimbursable only when there is an immediate threat to life, public health and safety.

- o Title 19, Section 2925 (2) (A-C)) does allow for the removal of debris under the following:
  - (2) For purposes of this program, the removal of debris from private property shall be reimbursed only when there is an immediate threat to public health and safety. In a case where reimbursement for debris removal from private property is authorized by the agency secretary, the following requirements shall apply, unless waived in part or full by the agency secretary:
    - (A) The property owner must remove all disaster-related debris from the property to the curb or public right-of-way;
    - (B) The local agency must obtain a signed statement from the property owner to the effect that the property owner does not have insurance covering the removal of the disaster-related debris; and,



(C) The local agency must have a signed statement from the property owner giving the local agency the right of entry and absolving the local agency and the state of any liability relative to removal.

(b) Criteria

Debris removal shall be considered necessary when removal will:

- (1) Eliminate immediate threats to life, public health, and safety;
- (2) Eliminate immediate threats of significant damage to improved public or private property, or,
- (3) Be necessary for the permanent repair, restoration, or reconstruction of damaged public facilities.

(c) Examples of Eligible Work.

- (1) Removing debris such as pieces of destroyed buildings, structures, signs, or broken utility poles;
- (2) Removing loose or broken sidewalks and driveways; or,
- (3) Removing fallen trees.

### **Federal Regulations for Private Property Debris Removal**

- (Stafford Act Sections 403 and 407 and 44 CFR 206.224(b)) provide the authority to fund eligible applicants to remove debris from private property. This work may only be eligible when:
  - o The disaster caused very severe and widespread damage.
  - o The removal is necessary to eliminate an immediate threat to life, public health and safety or to improve public or private property, or to ensure the economic recovery of the affected community to the benefit of the community-at-large.
  - o An eligible applicant, such as a municipal or county government, performs the work.
  - o The private property owner has provided all insurance information.
  - o It is pre-approved by the FEMA Regional Director and/or Federal Disaster Recovery Manager (DRM).
  - o Required legal documents are in place:
    - ♦ Insurance documents;
    - ♦ Hold Harmless Agreement; and
    - ♦ Right-of-Entry Agreement.
- In federally declared events, applicants and property owners must be aware that only FEMA makes eligibility determinations regarding removal of debris from private property. Not all actions that may be taken by the local governments are eligible for FEMA assistance.

## Demonstrating a Threat



### Demonstrating a Threat

- Review local ordinances & resolutions
- Local official makes determination  
(Must be immediate threat to public health & safety)



California Governor's Office of Emergency Services Disaster Debris Management

Remember, the reason to undertake a debris removal operation is to remove an immediate threat to the public health and safety, not because it's an "ugly nuisance". When it comes to private property, an applicant must demonstrate that removal of debris on private property is required to reduce this threat.

- A *resolution* after a disaster by an applicant that debris on private property constitutes a threat to public health and safety does not in itself make the debris removal eligible.
  - o The applicant should submit for review and approval specific legal requirements for declaring the existence of the threat.
    - ♦ A damaged structure may be a public health and safety hazard if it could be condemned as such, pursuant to the provisions of an applicant's ordinance related to condemnation of damaged structures. A qualified individual, such as a certified building inspector, must make this determination.
    - ♦ A public health hazard may exist if such a determination is made pursuant to the provision of an applicant's ordinance related to public health. An individual qualified to do so, such as a public health official, must make such a determination.
- The determination of work being required to ensure economic recovery must be carefully reviewed.
  - o Use of this criterion is normally restricted to the removal of disaster-related debris from large commercial areas to expedite restoration of the economic viability of the affected community.

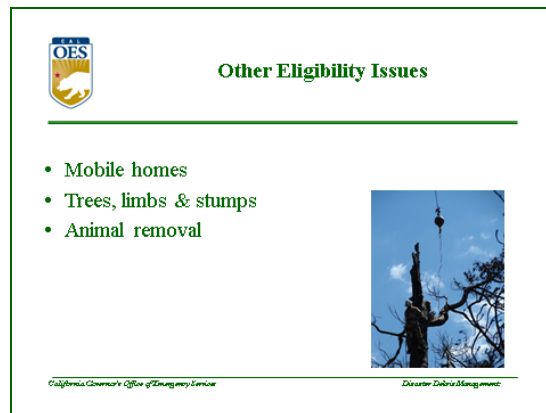
## Ineligible Debris



Only disaster-related debris that requires removal to reduce or eliminate an immediate threat is eligible for reimbursement. The following is not eligible for reimbursement:

- Privately owned vehicles, whether or not insured.
- Old white goods located on private property awaiting proper disposal.
- Old tires, batteries, or any equipment/material located on private property awaiting proper disposal.
- Damaged swimming pools, basements and foundations. If it is determined that a public safety hazard exists, FEMA may reimburse the cost of filling these structures.
- Reconstruction debris, sometimes called construction rubble, resulting from reconstruction activities. Removal should be a part of the renovation contract and is to be removed by the contractor.
- Debris that does not pose a threat is not eligible for removal. For example, miscellaneous debris, such as minor vegetation and rubble, is not eligible. Raking of private property to ensure glass and nails are removed is not eligible.
- If an eligible applicant damages private property as a result of eligible debris removal activities, repairs to the property are not eligible unless the damage results in a health or safety risk. Similarly, if private property is damaged by a Federal agency engaged in disaster response activities, the Federal government is not liable for repairs to that property.

## Eligibility Issues



### Mobile Homes

- In California, the Department of Housing and Community Development oversees mobile homes.
- During many disasters, especially a hurricane or tornado, there may be a large number of mobile homes totally demolished.
- The eligibility for mobile home removal should be evaluated as for any other residential structure - removal may be eligible if a threat can be demonstrated – but there are some unique aspects to the units themselves.
  - o Before demolition begins, the applicant should make arrangements to be sure remaining personal items, furniture, etc. that may remain in the units are removed.
  - o Check the units for asbestos and lead paint, and any other household hazardous waste.
  - o Units may need to be crushed or taken apart – few landfills will accept the units intact.
  - o Caltrans and DOT may have regulations relating to hauling demolished mobile homes on State/federal highways.
  - o Consider salvage of the metal components.

Mobile homes may present unique cleanup situations. Mobile Homes are normally treated as private property and should be removed with the owner's insurance proceeds. However, in some instances, there will be a need to quickly install replacement mobile homes resulting in the damaged mobile home debris being bulldozed to the right-of-way. In addition, mobile homes in a mobile home park are generally not eligible for public assistance as the mobile home park is considered a business.

### Trees, Limbs and Stumps

- Hazardous trees, limbs and stumps on public property within or adjacent to improved or publicly used space, and on private property that meet criteria of posing a threat, may be eligible for removal. Examples include:
  - o Trees alongside public roadways.
  - o Trees within a naturalized area of public parks or golf courses.
  - o Trees within private property posing a threat to health and public safety or to damage to residences.
- Hazardous trees that are unstable and leaning into the areas used by the public are eligible for removal. Normally, trees requiring removal are flush cut to the ground.

- A tree with more than 50% of the tree crown destroyed or damaged, a split trunk, or broken branches that expose the heartwood, or a tree that has been felled or uprooted is eligible for removal, especially if it is in a location approximate to or within public-use areas.
  - o If an applicant chooses to save a tree that has any conditions described above that justify its removal, the expense is the applicant's.
- Hazardous limbs are also eligible for removal. Hazardous limbs considered to pose a threat are those that are still hanging in the tree and are threatening a public-use area, such as a trail, sidewalk, road or golf cart path, or other improved and maintained property.
- Removal of fallen trees in a forested or wilderness area is not normally eligible.
- Removal of cut trees from subdivisions under development or off the right-of-way in rural areas is typically not eligible, as this condition generally does not pose an immediate threat.
- Reimbursement for stump removal is extremely limited.
  - o Normally, reimbursement is limited to removing stumps that have been uprooted, and are located in an area where they would be a safety hazard. If a tree has been broken, instead of uprooted, the "stump hazard" is removed by cutting the tree at ground level.

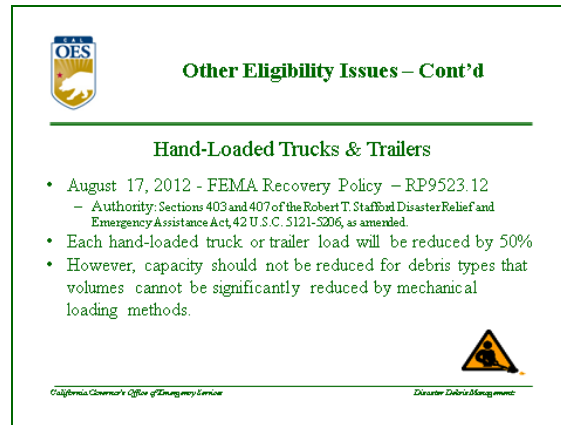
**Note:** *Angora Fire – 8,552 tons of trees were salvaged for lumber.*

### **Animal Removal**

- Disposal of farm and companion animals present unique challenges.
- Local emergency managers need to be involved if extensive numbers of dead animals are found.
- Because of potential health issues, disposal of dead animals needs to be addressed quickly.
- Disposal methods, burning or burying, need to be coordinated with appropriate environmental agencies.
- A specialty contractor may be needed to appropriately pick-up, haul and dispose of the animals.

**Note:** *California Department of Resources Recycling and Recovery (CalRecycle) has lists of renders for various areas on their website ([www.calrecycle.ca.gov](http://www.calrecycle.ca.gov)).*

## Debris Operations - Hand-Loaded Trucks and Trailers



### Authority

- Sections 403 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121-5206, as amended.

### Background

Debris removal companies under contract with local governments have frequently supplemented their vegetative debris removal operations by hiring subcontractors who modify their trucks and trailers by extending sidewalls with plywood or other materials to increase the vehicle's load capacity. Because of the tenuous nature of these improvements, operators typically load these vehicles physically by hand. The inefficiencies associated with loading these trucks or trailers by hand, instead of using mechanical equipment, effectively negates the increased capacity advantages of these vehicles. Hand loading cannot achieve compaction levels comparable to mechanically loaded vehicles. Further, the unit cost for transporting debris is based on mechanical loading of trailers and trucks.

FEMA performed studies throughout the State of Florida following the four devastating hurricanes in 2004 and determined that a mechanically-loaded vehicle had a weight-to-volume ratio at least twice that of hand-loaded vehicles. In other words, vehicles of the same measured capacity that were loaded by mechanical equipment and reasonably compacted carried at least twice the volume of debris as those loaded physically by hand. FEMA has therefore determined it is not reasonable to reimburse applicants - for hand-loaded vehicles and mechanically loaded vehicles – at the same rate.

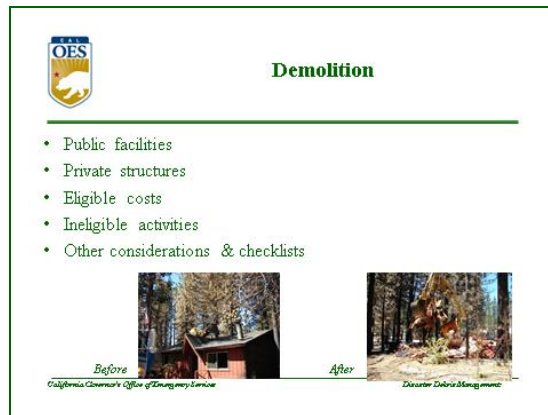
### Policy

Debris monitors located at temporary or final debris disposal sites will reduce the observed capacity of each hand-loaded truck or trailer load by 50% because of the low compaction achieved by hand-loading. For example, if a 40 cubic-yard (CY) hand-loaded truck or trailer arrives at a debris management or disposal site, and it appears to be 100 percent full, the actual quantity of debris in the truck or trailer will be recorded as 20 CY  $\{(40 \text{ CY} / 2) * 100\}$ . In the same manner, if the truck or trailer appears half full, the load will be recorded as 10 CY  $\{(40 \text{ CY} /$

2) \* 50% }. The maximum amount recorded for a hand-loaded vehicle will be 50% of its measured capacity. However, the capacity should not be reduced for debris types that volumes cannot be significantly reduced by mechanical loading methods.

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## **Demolition**



## **State Regulations**

Under Title 19, § 2930(4), the agency secretary under the following standards approves demolition of a damaged public facility or privately owned building:

- (A) The local agency must clearly possess the legal authority and responsibility to demolish the damaged facility. The local agency must also show that such demolition does not constitute a “taking” which would require the payment of compensation to the property owner;
- (B) The local agency requesting approval of building demolition of privately owned-buildings must be able to demonstrate that the property owner has no other source of funding to pay for structure demolition;
- (C) The local agency must have inspected each building and determined it to be a health or safety hazard. The local agency must have a certification to this effect signed by the appropriate agency official;
- (D) The local agency must have a signed statement from the property owner to the effect that the property owner does not have insurance covering the damage or the demolition of the building;
- (E) The local agency must have a signed statement from the property owner giving the local agency the right of entry and absolving the local agency and the state of any liability relative to demolition and removal;
- (F) The local agency must also comply with any other applicable state or federal health and safety regulation, law, or general requirements; and,
- (G) Eligibility is limited to the cost of demolishing designated buildings to the top of the foundation, removal and hauling debris to the waste-site, and back filling of basements to a safe condition.

## **Federal Regulations**

Sections 403 and 407 of the Stafford Act allow for the demolition of unsafe public or private structures that pose an immediate threat to life, property, or public health and safety.

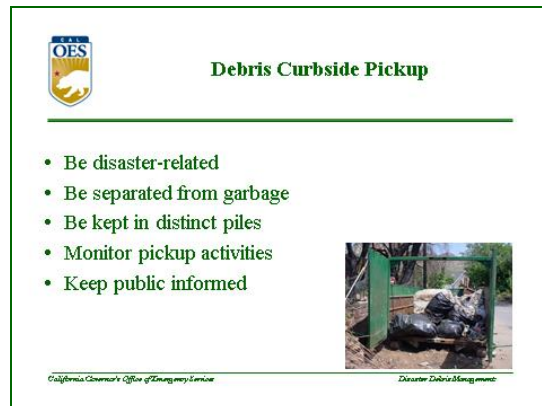
- The following is a summary of the key items of the FEMA Policy: Demolition of Private and Public Facilities (FEMA 9523.4) November 9, 1999, included in the Policies Section, and other references.
  - o Public and PNP Eligible Facilities.
    - ♦ Section 403 requires that the structures must be damaged by the disaster.
    - ♦ The structures must be determined to be unsafe and pose an immediate danger to the public. This determination must be made by local officials and verified by State and Federal officials.
    - ♦ Work must be completed within Emergency Work deadlines (44 CFR 206.204 – 6 months plus extensions).
    - ♦ Additionally, Section 407 allows for demolition in the public interest, ensuring economic recovery, but this only applies when the first two criteria above are met to the satisfaction of the Regional Director, and the structures have been uninhabited since the major disaster. The timeline for emergency work completion does not govern this authority.
  - o Private Structures.
    - ♦ The structures must meet the first three criteria defined above for Public and PNP Facilities.
    - ♦ Liability and legal permission requirements must be met.
    - ♦ Slabs or foundations, broken or intact, generally do not present a health or safety hazard to the general public. Slabs removed primarily for reconstruction are not eligible.
    - ♦ Individuals and private organizations (non PNPs) will not be reimbursed for their efforts on their own property.
  - o For health and safety reasons, the following demolition costs are eligible:
    - ♦ Capping wells.
    - ♦ Pumping and capping septic tanks.
    - ♦ Filling in basements and swimming pools.
  - o Not eligible activities include:
    - ♦ Concrete slabs removed for reconstruction purposes, even when brought to the curbside.
    - ♦ Removal or covering of pads and driveways.
    - ♦ Structures condemned as safety hazards before the disaster.
    - ♦ Habitable, but not yet damaged, structures even when they are in serious danger of total destruction (for example, on a failing slope).
  - o Section 404 Hazard Mitigation.
    - ♦ When part of the Section 404 Hazard Mitigation buyout and relocation project, the removal of substantially damaged structures including slabs, driveways, fencing, garages, sheds and similar appurtenances are eligible.
  - o Insurance must be considered.
- All work must be reviewed in accordance with environmental, historic and other Federal laws.

### **Other Considerations**

Demolition of a structure is not always the most cost-effective health and safety alternative. For example, “attractive nuisances” where structural integrity has not been compromised, cleaning and securing the facility may be the best option.




## Curbside Pickup



Generally, disaster-related debris from private property must be brought to the curbside and collected by an eligible applicant.


- Construction and demolition materials from repairs and reconstruction should not be placed at curbside.
- Items such as grass-clippings, household garbage, automobile parts, are not eligible.
- Residents should not mix normal garbage with disaster debris. Normal garbage pickup schedules should resume as soon as possible.
- Segregation of the types of debris will make the process go smoother and faster.
  - o Applicants may be asked to separate their debris into the following categories;
    - ♦ Woody debris and yard waste;
    - ♦ Household waste (damaged personal goods);
    - ♦ Household Hazardous Waste (HHW); and
    - ♦ Construction and Demolition (C&D) waste (removed by the homeowner, not as a result of reconstruction).
- The State, FEMA and/or the applicant should monitor the pickup activities to ensure that eligible materials are being collected and unnecessary mixing of debris does not occur.
  - o The local agencies should work with their State and Federal counterparts to establish deadlines for debris pickup. The residents should be informed as soon as possible of the criteria for pickup, schedule and deadlines.
- Debris can be removed directly off private property under special circumstances. These instances must be documented.

## Hazardous/Toxic Waste



### Hazardous/Toxic Waste

- Responsibility of the Department of Toxic Substances Control (DTSC) & US Environmental Protection Agency (EPA)
- Eligible activities
  - Household Hazardous Waste
  - Technical assistance
- Ineligible activities
  - Long-term cleanup



California Governor's Office of Emergency Services Disaster Debris Management

Major hazardous and toxic waste components are generally the responsibility of the Department of Toxic Substances Control and the Environmental Protection Agency.

### State

The Department of Toxic Substances Control regulates the following within the State:


- Regulate asbestos. (This could also fall under the Air Resources Board's jurisdiction, or OSHA's depending on whether the asbestos is being disposed of or ground up.)
- Regulate lead (primarily lead based paint on wood and metal) and household hazardous waste.
- Regulate cleanup on hazardous materials.

### Federal

FEMA regulates the following:


- The PAO will coordinate with Cal EMA and FEMA Headquarters at the beginning of a disaster to determine if there have been any agreements with the EPA on addressing HAZMAT for the specific disaster.
  - o For example, FEMA HQ may determine if retrieving and disposing of orphan drums and barrels will be funded by FEMA or through the EPA.
- FEMA generally will fund the removal and disposal of Household Hazardous Waste.
- FEMA may provide technical assistance to States on disposal methods.
- Activities related to long-term cleanup are generally not eligible for FEMA funding.
- State/Tribal/local costs for long-term clean-up measures.

## Insurance



### Duplication of Benefits

- Insurance
  - Conventional coverage for debris removal (2.5% average)
- Individual Assistance (IA)
- Small Business Administration (SBA)



California Governor's Office of Emergency Services      Disaster Debris Management


In many instances, debris removal for both public and private activities is covered by conventional insurance.

- Check insurance policies to determine coverage for debris removal activities.
- Homeowner's insurance policies often cover structures, fences, and playground equipment.
  - o Usually does not cover vegetative debris.
  - o Homeowners should consider using insurance funds to pay for the removal of debris that is not eligible for reimbursement. This can include:
    - ♦ Concrete slabs
    - ♦ Foundations
    - ♦ Sidewalks
- The responsibility for collecting the insurance coverage, whether it is for public or private activities, rests with the applicant.
- The right-of-entry and release from liability document should include a requirement for the homeowner to forward insurance proceeds to the applicant.

**Note:** Angora Fire – \$4.2 million dollars from insurance proceeds was recovered under the El Dorado County Insurance Recovery Plan.

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## Reasonable Costs




### Reasonable Costs

**State - Title 19, § 2900(cc)**

- All project costs eligible under section 8680 et seq., of the Government Code, and shared costs of all projects deemed eligible for federal public assistance, after offsetting applicable credits

**FEMA – 44 CFR § 206.228**

- A cost that is both fair & equitable for the type of work being performed



California Governor's Office of Emergency Services      Disaster Debris Management

The definition of cost eligibility is that a cost must be reasonable and necessary to be eligible.

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**State - Title 19, §2900(c)**

- All project costs eligible under section 8680 et seq., of the Government Code, and shared costs of all projects deemed eligible for federal public assistance, after offsetting applicable credits.

**FEMA – 44 CFR, §206.228**

- A reasonable cost is a cost that is both fair and equitable for the type of work being performed. Communities often enter into contracts that may not meet the definition of reasonable cost.
- For example: charging \$75/CY for hauling debris is unreasonable when the going rate for similar work in adjacent locations is \$25/CY.
- The reasonable cost requirement applies to all labor, materials, equipment, and contract costs awarded for the performance of eligible work.

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**Eligible Costs**



Local agency costs are eligible for state financial assistance provided these expenditures are directly related to an eligible disaster event.

- Expenditures included in the local agency applications for state assistance must be reasonable and in accordance with the agency's standard cost allocation procedures.
- Funding will not be provided to an agency for damages caused by negligence.

**Force Account Labor**

To accomplish effective debris clearance in the early stages of the disaster response, an applicant may rely on personnel from various sources to perform or manage the work. The eligibility of this labor may vary per source.

The following wage costs are eligible for state and/or federal financial assistance:

- Personnel costs incurred as a result of the disaster are eligible; however, straight or regular time salaries and benefits of permanently employed staff performing emergency work are ineligible.

- Overtime granted as compensatory time off (CTO) and based on the standard rate (i.e. regular cash rate) for overtime pay.
- Wage additive costs, including retirement contributions, vacation, sick leave and other fringe benefits costs assessed against the regular wage rate of employees engaged in disaster related work activities.
- Seasonally employed personnel, when covered under existing budgets and used for a disaster during the season of employment, are considered permanently employed personnel for the purpose of cost eligibility.
- Temporary employees hired as a direct result of the disaster are eligible for both regular time and overtime pay.
- Local Share - Matching fund assistance for cost sharing required under federal public assistance programs is an eligible cost. PA programs include supplementary federal assistance for local agencies, other than the direct benefit assistance for individuals and families.

### **Force Account Equipment**

The State can authorize reimbursement of certain types of equipment costs:

- Actual equipment rental.
- Equipment costs for applicant-owned equipment, based upon the applicant's own rate schedules, or in the absence of an applicant's rate schedule on current Department of Transportation (CALTRANS) Labor Surcharge and Equipment Rental rates.
- Equipment rates must cover normal costs of lube, repair, overhaul, depreciation, interest, insurance, storage, and taxes. The schedule must also include fuel and oil for self-powered equipment.

FEMA will fund the least costly of the available rates.

- Cost of labor to operate equipment is an additional cost.
- Extraordinary expenses for repairs and maintenance required due to severe conditions in disaster operations may be eligible for reimbursement under FEMA Policy 9525.8, Damage to Applicant-Owned Equipment, dated August 17, 1999 provides criteria for and examples of eligible conditions.

### **Interagency Assistance/Mutual Aid Agreement, Volunteers**

Debris activities may be performed through Mutual Aid Agreements and volunteer organizations.

- Eligible costs include only those reasonable costs invoiced or billed in accordance with reimbursement provisions contained in such interagency agreements.
- Costs for work performed under interagency assistance/mutual aid agreements between local governments or local governments and state agencies, include but are not limited to:
  - o contracts;
  - o cooperative agreements; or
  - o assistance-for-hire agreements.

### **Contracts**

Costs of contractors used to accomplish emergency work are eligible for reimbursement.

- All work must be bid as required under applicable state or federal laws or regulations or, including 44CFR, part 13, whichever is the more restrictive.
- This topic is covered further in the Contracting Module of the State Disaster Debris Training.

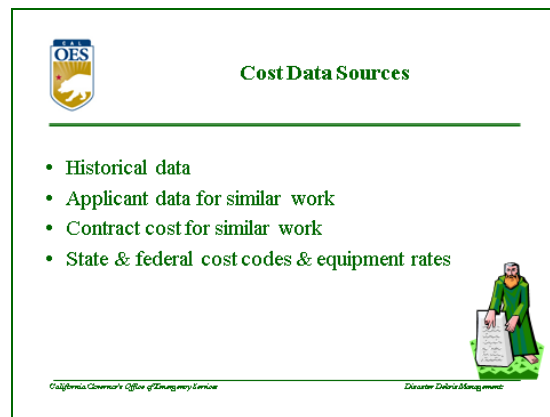
## **Project Management and Monitoring Costs**

It has been found that defining an acceptable percentage to estimate these costs is not appropriate.

- For example: There can be extensive amount of debris deposited in a relatively small area (say from a tornado) that requires minimal project management and a small number of monitors, or the same amount of debris widely scattered (hurricane event) that may require much more management and monitoring.
- Associated costs must be evaluated on a case-by-case basis – considering a reasonable amount of effort of appropriate level personnel. For example: it is unlikely that professional engineers would be necessary to monitor debris operations.

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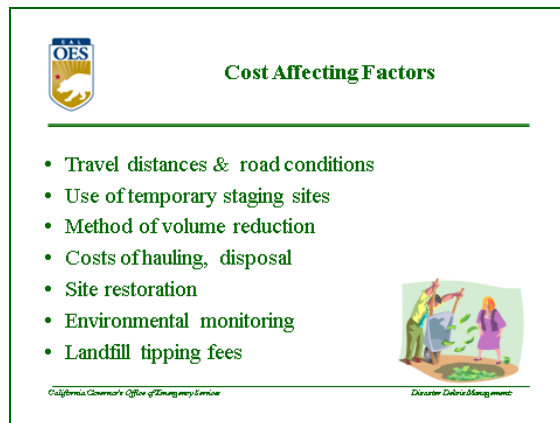
### **Cost Data Source**



Costs for work to be performed should not be determined arbitrarily. There must be some basis for the reasonableness.

- Costs may be determined by reviewing:
  - o Historical data for similar work – within the locale or region, check previous disasters;
  - o Applicant data for previous similar work (either force account or contract);
  - o Contract costs for similar work being done in the area;
  - o Cal OES services data; or
  - o State and federal cost codes for force account work.
- Available cost data may need to be adjusted to reflect:
  - o Time frame of the operation – costs may be higher immediately after the disaster but implementation of a bidding process for pickup and disposal should reduce costs; or
  - o Location of the operation – accessibility for debris pickup and disposal.
- Documenting costs on the Damage Survey Report or Project Worksheet.
  - o Document source and basis of cost; identify factors that result in higher costs.
  - o Check estimates against actual costs if work is underway – use actual quantities and rates when available.
  - o Verify costs and quantities through monitoring.

## Cost Affecting Factors



Each debris operation has unique aspects that affect the total cost, whether the work is performed by force account or contract.

These factors may include:

- Travel distance.
- Temporary Staging Sites.
- Volume reduction method.
- Hauling and disposal.
- Site restoration.
- Environmental monitoring.
- Security at the Debris Management Site to prevent off-hour dumping.
- Some landfills may have a daily cap on how much waste it can landfill in a day – a special waiver may be needed by Cal Recycle or the Local Enforcement Agency (LEA) to allow emergency debris disposal over the regulated daily cap.
- Tipping Fees.
  - o The Cal Recycle can indicate if there is a regulatory office that approves landfill-tipping fees.
  - o The charging of tipping fees should be consistent, and not waived for some and charged to others.
  - o Waived tipping fees are not reimbursable.

## Re-Use and Recycling Markets



### Re-Use & Recycling Disaster Debris

- Timber
- Wood debris
- Vegetative debris (mulched)
- Construction & demolition debris
- White metals (appliances)
- Scrap metals
- Recyclables (cans, plastic & glass)



California Governor's Office of Emergency Services

Disaster Debris Management

Debris generated by a disaster may have a market value. Any revenue generated from debris must be used to offset the project cost.

- Reasonable costs expended by the applicant to administer and market the sale of the materials may be recouped by the applicant from the proceeds.
- If a contract provides for the contractor to take possession of the material in return for lower bid prices, there is no salvage value to be recouped.



## Re-Use and Recycling Markets for Disaster Debris

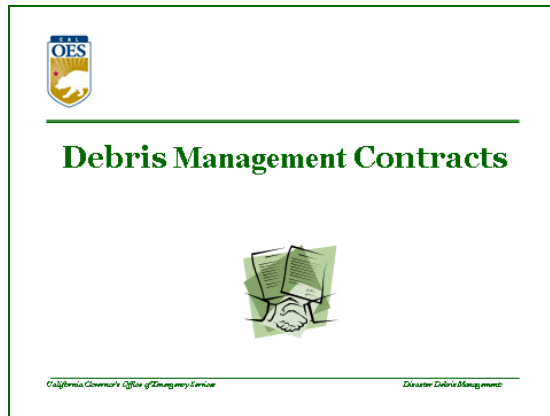
Debris Type	Use	Markets
Vegetative Debris	Food waste: Compost Trees, branches, leaves: Mulch, landfill cover, fuel	Farms, composting facilities, landslide companies and landfills
Inert Debris	Gravel, backfill, soil amendment, landfill cover	Cement manufacturers, soil amendment/horticultural industries, landscape companies, landfills and construction companies
Construction & Demolition	<p>Asphalt: Recycled asphalt</p> <p>Concrete: Aggregate base, sidewalk backfill, gravel road cap, decorative gravel</p> <p>Construction lumber: Re-use, fuel, bulking agents</p> <p>Construction plastics: Re-use or recycle</p> <p>Drywall: Gunit mix, soil amendments, new drywall, re-use</p> <p>Carpet: Secondary fibers for recycled content products</p> <p>Metals: Scrap metal</p>	<p>Public works construction contractors, construction companies, asphalt recyclers, public works departments</p> <p>Construction companies, building restoration &amp; repair contractors, cogeneration plants, waste to energy plants</p> <p>Plastics recyclers, construction companies, salvage dealers</p> <p>Drywall manufacturers</p> <p>Carpet recyclers and rag industry</p> <p>Construction companies, metals recyclers, salvage dealers, smelters and steel mills</p>
Personal Property	Repair and re-use	Resale shops, non-profit organizations
Damaged White Goods	Repair and re-use, metals salvaged	Resale shops, repair shops, second hand appliance shops, scrap metal dealers
Damaged Vehicles	Repair and re-use, salvage	Resale, metal salvage yards
Hazardous Wastes	Latex paint: recycle Used motor oil: recycle	Paint manufacturers Motor oil manufacturers
Bi-Metal Containers, Plastic & Glass Bottles, Sand Bags	Recycled	Standard Recycling Markets Cement Manufacturers

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# Debris Contracting

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## Introduction



Communities that fail to comply with proper contracting procedures or enter into inappropriate contracts may experience severe financial consequences.

- Communities may end up paying a contractor for work that was not originally part of the contract
- The period of performance may become excessive such that the work is not completed in a timely manner to meet the needs of the community.
- Lawsuits may result by the community (residents), the contractor, or both.
- If there is a state or federal disaster declaration:
  - o The community may not be reimbursed for all costs incurred, even if payment must be made to the contractor.
  - o There may be delays in funding pending the results of audits, collection of documentation, justification of costs, etc.

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## Debris Contracting Issues and Responsibilities



- Debris management planning
- Clearance
- Removal & hauling
- Demolition
- Temporary debris management sites



- Recycling
- Household hazardous waste
- Asbestos
- Final disposal
- Monitoring
- Project management

If the magnitude of the emergency debris operation is beyond the capabilities of local force account resources, State resources, mutual aid agreements, and volunteer labor and equipment, contracting for labor and equipment may be necessary. Contracted activities may include:

- Debris management planning (*Not eligible if done prior to the disaster*)

- Clearance, removal and hauling
  - Separate contracts may be prepared for clearance activities and removal and hauling
- Demolition
  - Demolition activities are generally beyond the capability of most communities forces
- Debris Management Sites
  - Overall operations or specific activities
- Recycling or Volume Reduction Activities
- Removal and Disposal of Household Hazardous Waste, Asbestos and other hazardous materials
- Final Disposal
- Monitoring
- Overall Project Management

**Note:** *Project Management costs are sometimes eligible for state and/or federal assistance, but this depends upon the magnitude of the event, the impact to the community, reasonableness of the costs, etc.*

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### Contracting – To be or not to be?



#### Debris Contract

- Amount and types of debris
- Private property removal
- Debris concentration area
- Debris management site locations
- Landfill disposal site locations
- Task requirements
- In-house capabilities



California Governor's Office of Emergency Services      Disaster Debris Management

With a wide range of possible contracted activities, communities need to anticipate their contracting needs during debris management planning. The community should:

- Assess the potential amount and mix of debris from an anticipated event
- Determine a plan for collecting, hauling and disposing the materials
- Assess the capability of their own forces to perform the work
- Issues to consider in determining if work should be contracted include:
  - Potential quantity and composition of debris – how much and what type
  - Is removal from private property anticipated?
  - How widespread is the forecasted debris, and where will it be located?
  - Where is the location of the debris management sites or landfill disposal sites?
  - Will recycling be done?
  - What are the requirements for accomplishing these activities?
  - What are the in-house capabilities?

## Contract Preparation



Prior to a disaster, it is recommended that communities prepare:

- Pre-approved contractor list
- Standby contracts that are pre-awarded executed and ready for implementation
- Sample contracts that are pre-drafted and ready to be finalized, advertised and awarded

Many local governments use a contracting specialist to prepare their contracts. The specialist should:

- Closely coordinate with debris staff to ensure that all technical aspects are correct and the scope of work is appropriate
- Ensure the appropriate type of contract is used for the work to be performed – time and materials, unit price, lump sum (discussed later in this unit)
- Ensure compliance with proper bidding and award procedures
- Be responsible for all contract administration and documentation
  - A complete file of the process should be maintained, including development of the scope of work, a copy of the bid advertisement, summary of bids received, selection process and basis, invoices, memos of meetings, etc.

Often contractors will offer use of a contract prepared by their company. Although this offer may seem attractive in the essence of time, the contract should be reviewed by legal counsel to ensure:

- It is technically and legally correct
- It has proper safeguards for the awarding entity
- The work covered by the contract is eligible for reimbursement
- The payment is not being made for technical advice available free from the State or FEMA. This includes instructions on completing project worksheets, eligibility, contracting, environmental requirements, etc.

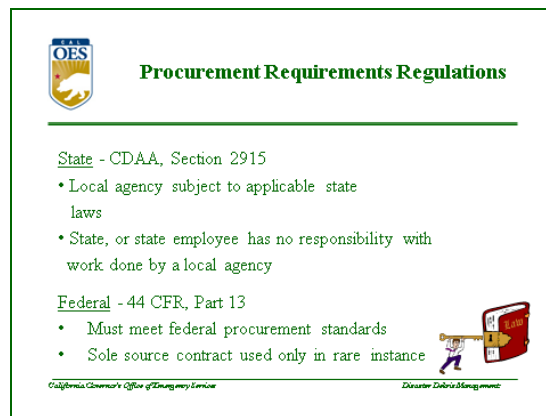
While communities may enter into any contracts they wish, Cal OES and FEMA are not a party to those contracts. These communities are strongly encouraged to work with state and federal personnel to ensure that the costs set forth in the contracts they are considering are eligible for reimbursement.

- To facilitate assistance to communities in this matter, Cal OES/FEMA staff will be available to provide technical assistance before contract execution to help ensure compliance with the provisions of the PA Program, as well as other applicable statutes and regulations
- If a contract is in-place prior to meeting with Cal OES/FEMA, the terms of the contract should still be discussed to ensure compliance issues

Regardless of who prepares the contract or provides technical assistance in its preparation, the community is ultimately responsible for the terms of the contract, including:

- The scope of work is accurate and appropriate
  - All documentation is complete and appropriate
  - The work performed is eligible and the costs are reasonable
  - The work is adequately monitored
- 

### Procurement Requirements



In large debris generating events, communities often become overwhelmed with the activities to be performed and do not comply with proper procurement requirements. Local governments must comply with all State, federal and local procurement requirements.

### State

#### CDAA, Section 2915

##### (a) General Provisions

(1) Applicants receiving federal disaster assistance funds must comply with applicable federal contracting and procurement requirements contained in Title 44, Code of Federal Regulations (CFR), part 13, Sections 13.35 and 13.36, and Office of Management and Budget Circulars (OMB) A-102 (Revised 10/7/94, As Further Amended 8/29/97) and A-110 (Revised 11/19/93, As Further Amended 9/30/99). Funds withdrawn by the federal government, due to non-compliance with the applicable federal contracting and procurement requirements shall result in a loss or reduction of state cost-sharing assistance. The state shall not provide additional funding to an applicant to substitute for federal funding withdrawn as a result of noncompliance with federal regulations.

2) Any work performed by a state agency, at the request of a local agency, shall be agreed upon in writing and subject to the state Public Contracts Code. Work performed by a local agency shall be subject to the



laws governing the performance of such work by the local agency and any other applicable state or federal laws. Neither the state nor any officer or employee thereof shall have any responsibility in connection with any work performed by a local agency.

(3) Any contract executed between the local agency and the agency secretary, pursuant to the Act, shall contain a provision under which the local agency agrees to hold the state harmless from damages resulting from the work for which funds are allocated; and

(4) A payment bond is required on all contracts involving expenditures in excess of twenty-five thousand dollars (\$25,000), pursuant to sections 3247 and 3248 of the Civil Code, on any public work for a political subdivision including, but not limited to, improvements and replacements of any building, road, bridge or other structure.

## **Federal Regulations**

- Federal procurement standards must be met, or exceeded, if FEMA assistance is to be requested on Presidentially declared disasters
  - o Title 44 of the Code of Federal Regulations, Part 13 covers grant administration, including procurement and contracting criteria
  - o Normal State and local procurement requirements must still be followed, but such regulations must be at least stringent as the Federal procurement regulations (Part 13)
- To be eligible for FEMA assistance, competitive bidding must be used except for initial emergency situations
  - o Non-competitive (sole source) contracting is acceptable ONLY in rare circumstances where there can be no delay in meeting a requirement, such as for emergency road clearance
  - o Not all “emergency” work requires “emergency” contracting procedures. Competitive bidding normally can be resumed within days of the disaster.
- If the Governor waives contracting procedures because of the emergency that does not necessarily mean competition is suspended. It generally means that time can be compressed. Emergency contracting still may require, or can use, competitive bidding
  - o In the past, many communities have successfully developed a scope of work, identified contractors that can do the work, and made telephone invitations to bids to expedite the process

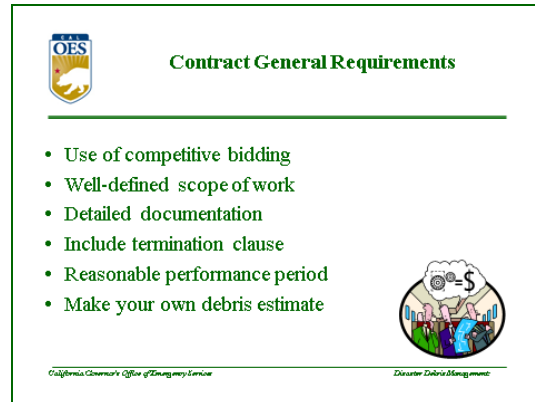
## **Contractor Selection**

For declared disasters, a community PA applicant is not required to select the low bid in the competitive bid process. The community may use their normal bid evaluation criteria in selecting a contractor.

- Under state and federal regulations consideration may be given to the following factors when selecting a contractor:
  - o Contractor integrity
  - o Compliance with public policy
  - o Record of past performance
  - o Financial and technical resources
- In addition, other criteria that may be considered includes:
  - o Cost – ensure costs are reasonable. Costs that appear too low may not actually be attainable by the contractor and problems may arise when the contractor is faced with modifying work procedures to cover costs and maintain profits
  - o Other current obligations/work commitments – is sufficient staff available to complete work in a timely manner?
  - o Proposed work plan

- o References
  - o Use of local resources
- 

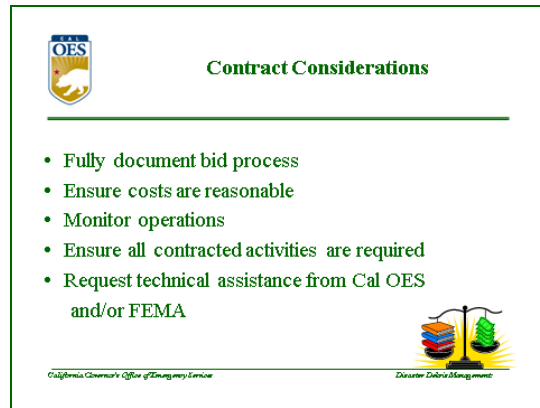
### **Contracts – General Requirements**



The following are general requirements to be carefully considered and included in debris-related bid documents and final contracts:

- Use competitive bidding
  - o Identify criteria for the work, including
    - ♦ Criteria for responding – time, scope of response
    - ♦ How long between award and time to mobilize
- The scope of work must be well defined and each intended task specifically addressed
  - o Be comprehensive, but concise
  - o Without specific language for each task, the contractor may perform work that was not originally intended, or fail to perform work that must be redefined often at additional cost
  - o For Presidentially declared disasters, eligible work must be clearly defined
- Documentation is a critical component in supporting contractor invoices and in supporting reimbursement
  - o Records should be auditable
  - o Lack of proper documentation can jeopardize or delay funding
- Include a termination for convenience clause – this will provide the community the option to cancel the contract for any reason
- Define a reasonable period of performance
  - o Determine when the work needs to be complete – otherwise, the work may not be performed in a timely manner to meet the needs of the community
  - o Include penalties if the work is not completed within the specified period of performance
- Base the contract on an estimate of debris as prepared by the community staff. Do not rely on contractor estimates

## Contract Considerations



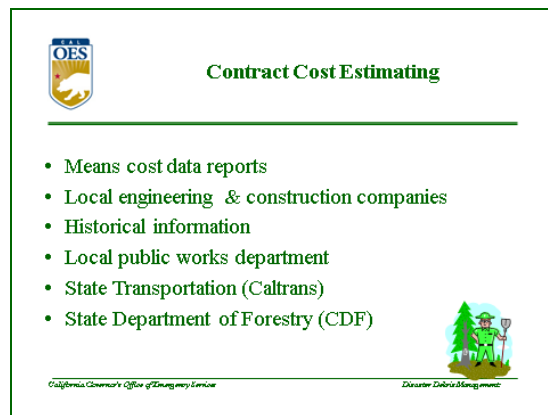
When state and/or federal funding is involved, or expected:

- Ensure the process is fully documented, including bid advertisement, responses, contract award, etc.
- Ensure the costs are reasonable, and include a justification of costs
  - o Only reasonable costs will be reimbursed
- Ensure the activities are well-monitored and the process of monitoring is documented
- Ensure that all activities included in the contract are required for debris removal, and are eligible for reimbursement

If there are any questions regarding any aspects of the contracting, the community may request technical assistance from the State or FEMA.

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## Contract Cost Estimating




To estimate a reasonable cost for a contract, the community may consult the following sources for cost data:

- Publications such as Means Cost Data Reports
    - o Depending upon what is being contracted, these documents may include costs on specific equipment
  - Local engineering and construction firms
-


- o These firms can be employed to develop the cost estimate, or may be willing to provide some basic data
  - Historical data
    - o These data do not necessarily have to be for the same work, as long as the work is similar. It will provide a guide and some justification of costs.
  - Local Department of Public Works
    - o This department usually is involved in contracting for various types of work using the same types of equipment needed in debris-related activities
  - State Department of Transportation (DOTs)
    - o Most DOTs maintain a comprehensive bid tabulation breakdown showing the average price paid for various contracted work
  - State Department of Forestry & Fire Protection
    - o May be able to provide input to the cost estimate
- 

### **Contract Cost Estimating – Cont'd**


**Contract Cost Estimating – Cont'd**

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- Type of debris
- Removal method
- Transportation
- Permit requirements
- Work site limitations




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Disaster Debris Management

**Contract Cost Estimating – Cont'd**

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- Site access
- Truck size
- Disposal site distance & route
- Traffic conditions
- Roadway conditions



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Disaster Debris Management

When evaluating a reasonable cost for debris-related activities, various factors must be considered:

- Type, mix and amount of debris.
  - o The type and mix of debris will have a significant impact – how much is vegetative, how much is C&D? Is there any asbestos? What about household hazardous waste? Is any demolition required? What special handling and disposal requirements must be considered due to the type and mix?
  - o The amount of debris will affect the cost. Often, but not always, the larger the magnitude of debris, the less the unit cost
- Method of removal
  - o How will the debris be removed? Front-end loaders and trucks? Is special equipment required?
- Permitting requirements
  - o Including permits for handling household hazardous waste, to operate Debris Management Sites, for demolition
- Any limitations at the work site
  - o Work hours may be limited, there may be competitive work going on
  - o In some areas, there is a limitation on truck size. In older cities, with narrow streets, small trucks and other equipment will be required. There will be competition for equipment and highway space, so there may be a lack of available trucks. This is a particular problem in the US Territories.

- Access to the debris, the debris management sites, and the final disposal site
    - The type and width of the road may limit the size of equipment that can be used.
    - Access to the debris management site may be limited by lack of access roads
  - Depending upon the type and amount of debris, the haul distance may be lengthy (or take extensive time)
    - The closest site was almost 100 miles away. In CA, hauls of over 100 miles have been necessary. Debris from 2007 Fire at Lake Tahoe was taken to locations in Nevada. Debris in Crescent City is taken to Oregon.
    - Routes may be narrow and winding, increasing haul times
  - It may be necessary to haul the debris through areas of heavy traffic, increasing haul time
  - Roadway conditions may be bad because of the incident, rescue and emergency equipment, and heavy equipment usage
- 

## **Bids**



When preparing bid solicitations, include the following costs or sections:

- Bond and insurance requirements
  - This is a protection for the community; however, there are costs associated with them
- The requirement for rights-of-entry and hold-harmless agreements to enter private property
- Costs of mobilization and demobilization
  - In large disasters, these efforts can be quite costly, but are a cost to the contractor
  - The work includes organizing the equipment, moving it to the site, then doing the reverse
- Environmental monitoring may be required
- Safety requirements must be reviewed, and could increase costs
- Debris management site clearance and cleanup
  - If a good environmental baseline study is conducted, and a monitoring program is implemented, this should be relatively easy
  - Section related to state and federal eligibility requirements, and the necessity for the contractor to comply with those requirements

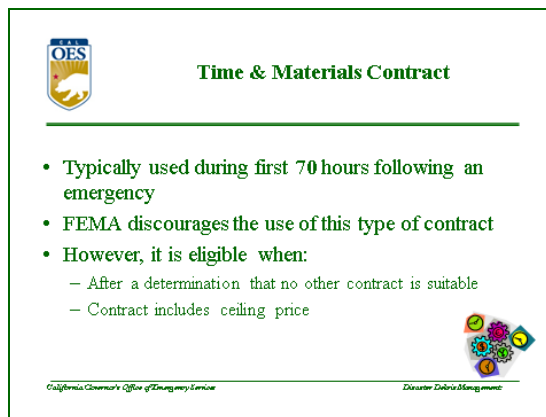
## Contract Types



It is important for a community to understand the types of contracts that may be appropriate for various types of work.

- There are three basic types of contracts:
    - o Time and Materials
    - o Unit Price
    - o Lump Sum
- 

## Time and Materials Contract



A Time and Materials contract is based on hourly rates for personnel and equipment.

- The contractor is paid an hourly rate for the actual time performing the specified work.
- Bids should include all overhead costs.
- Standby time.
  - o For rental equipment, if determined cost effective by the agency secretary.
  - o Standby time for applicant owned equipment is not allowed
  - o Standby time is not an eligible cost for FEMA reimbursement.


## **Federal Emergency**

- Under federal regulations (44CFR, Part 13.36), time and material contracts can be used when:
  - o After a determination that no other contract is suitable, and
  - o If the contract includes a ceiling price that the contractor exceeds at its own risk
- Time and Materials contracts may be the most appropriate method of contracting during first 70 hours following an emergency.
  - o Generally, in the first 70 hours after a disaster, clearing debris from the roadways for access rather than removing debris to disposal areas is the most important activity a community is involved in with regard to disaster debris activities.
  - o Applicants often use a Time and Material contract to perform this work
- All Time and Materials contracts should clearly state:
  - o The price for the equipment applies only when the equipment is operating.
  - o The hourly rate includes the operator, fuel, maintenance and repair.
  - o The community reserves the right to terminate the contract at its convenience.
  - o The community does not guarantee a minimum number of hours.
  - o The contract has either a dollar ceiling or a not-to-exceed-number-of-hours clause.
  - o The hours of operation of the contractor (to ensure monitoring is on-going when the contractor is working and to minimize disruption to the community).

## **Regarding Presidentially declared disasters:**



- To be eligible for federal reimbursement, FEMA would like time and material contracts to be limited to a maximum of 70 hours of actual emergency debris clearance work and should be used only after all available local, tribal and State government equipment has been committed
  - o The 70 hours provides time for:
    - ♦ Moving the debris from the roadway to the curbsides or rights-of-way to allow passage of emergency vehicles, and
    - ♦ Negotiating unit price and/or lump sum contracts.
  - o If a PA applicant awards multiple time and material contracts, those contracts should run concurrently, not consecutively
    - ♦ The 70 hours begins when the first contract is awarded
- Cal OES has prepared a Flyer entitled “Debris Contracts” and has been included as a reference document. This document is also available on the Cal OES website.

## Time and Materials Contract – Cont'd



### Time & Materials Contract

<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none"><li>• Extremely flexible</li><li>• Not dependent on scope</li><li>• Ready for immediate response</li><li>• Contractor assumes the risk</li></ul>	<ul style="list-style-type: none"><li>• Requires close contractor oversight &amp; direction</li><li>• Requires documentation of actual equipment &amp; operator hours</li><li>• Requires full-time, on site monitors</li></ul>



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### Advantages:

- Extremely flexible, not scope-dependent
- Has a wide range of uses – clear major access routes or access to critical facilities
- Available for immediate response activities - Is suitable for emergency "hot spots" and early debris rights-of-way clearance

### Disadvantages:

- Requires close contractor oversight and direction as to what work to perform
- Requires documentation of actual hours worked by equipment and operators
- Requires competitive bids or negotiated reasonable hourly rates for equipment and operators
- Specifies equipment as generically as possible to encourage competition
- Requires full-time (on-site at all times with the contractor) and trained contract monitors to document actual equipment usage

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## Unit Price Contract



### Unit Price Contract

- Work done on item-by-item basis with cost per unit
- Requires full-time trained third party contract monitors
- Requires all trucks to be accurately measured & numbered
- Requires all truckloads to be documented





California Governor's Office of Emergency ServicesDisaster Debris Management

A unit price contract uses construction units (Cubic Yards, Tons, Each) and prices to develop line item costs and total contract costs. Contract work is done on an item-by-item basis with cost determined per unit.



- The unit price contract should be used when the scope of work is difficult to define. The contract will be based on estimated quantities.
  - There must, however, be specific documentation compiled during performance of the work to support the actual quantity of work completed
  - Therefore, to be properly administered, unit price contracts should have full-time, trained monitors to ensure compliance with contract requirements
- 

### **Unit Price Contract – Cont'd**

 <b>Unit Price Contract Advantages</b>	
<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none"><li>• Is flexible</li><li>• Accurate account of actual quantities removed</li><li>• Wide range of competition</li></ul> 	<ul style="list-style-type: none"><li>• Segregation of debris complications</li><li>• All trucks must be numbered, measured &amp; documented</li><li>• Possible contract fraud</li></ul> 
<small>California Governor's Office of Emergency Services</small>	<small>Disaster Debris Management</small>

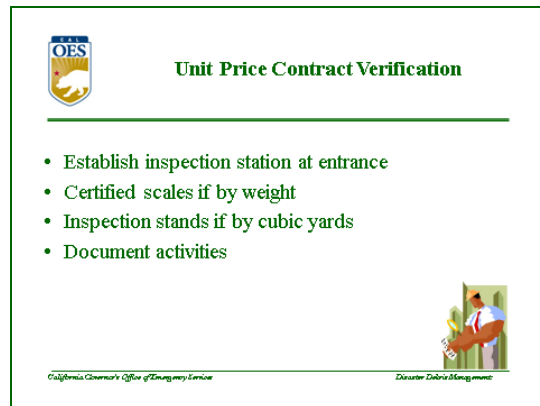
#### **Advantages:**

- Is flexible – don't need to get an exact determination of the amount of debris (but a good estimate will provide assurance that total quantities are reasonable – estimate should be determined by the PA applicant, not the contractor)
- Requires accurate account of actual quantities removed in either cubic yards or tons
- Ensures a wide range of competition because of simplicity of contract
- Has a low risk for the contractor (and great advantages if quantities can be maximized)

#### **Disadvantages:**

- Proper administration requires dedicated contract monitors at the pickup site and at the disposal site
  - Collected debris must meet terms of contract and FEMA eligibility criteria
  - Trucks must be sufficiently loaded
- Has possibility of contractor fraud if loading and dumping operations are not closely monitored
- Is complicated if segregation of debris is required
- Requires all trucks to be accurately measured (for cy payment) or weighed (for ton payment), and numbered – and periodically verified
- Requires all truckloads to be documented. For most accurate accounting, a pre-numbered load ticket should be used. Load tickets are the verification of the estimated quantity of debris in cubic yards or tons deposited at the dumping site.

## Unit Price Contract Verification

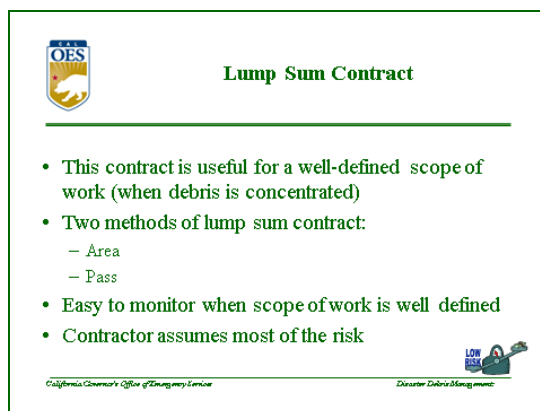


On FEMA projects, unit price contracts will require the PA applicant to have a verification process in place to help them in the documentation for their claim.

- When using volume (cubic yards) measurements, an inspection station at the entrance and exit of the disposal site is critical in verifying the contractor's loads and to ensure that the load has been fully dumped
- When using weight (ton) measurements, certified scales must be used
  - o Scales must be certified by person licensed by the State
- A systematic method of recording load and measurement data must be in place. Load tickets are normally used as the basis for verifying quantities.

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## Lump Sum




A lump sum contracts are useful for a well-defined scope of work (when debris is concentrated) with a clearly defined scope and a total price.

- The lump sum contract should be used only when the scope of work is clearly defined by the community (not the contractor), including quantity, type and location of debris.
  - o This information will be used to judge the reasonableness of the cost for reimbursement.

- o Change orders must clearly state the reason for the change; why the debris was not considered in the original contract, the exact quantity, mix and location, etc.
  - It is understood in a lump sum contract that the price for the work is fixed unless the scope of work changes; therefore, the bottom line of the contract is not in question, as it is with the unit price contract.
  - There are two methods of measurement:
    - o Area method
    - o Pass method
- 


### **Area Method**



**Lump Sum - Area Contract**

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<u>Advantages</u>	<u>Disadvantages</u>
<ul style="list-style-type: none"><li>• Minimum management needed</li><li>• Contractor assumes most of the risk</li><li>• Price is based on estimated quantity</li></ul>	<ul style="list-style-type: none"><li>• Needs very clear, definite scope of work</li><li>• Can be difficult to estimate amount of debris</li><li>• High probability of claims</li></ul>



California Governor's Office of Emergency ServicesDisaster Debris Management

The area method of a lump sum contract is used when a defined area is provided. For example, once all the debris within a well-defined area has been placed at the curbside, a scope of work can be written that requires the contractor to conduct a one-time pass to be removed all identified material from the curbside and placed at a specified location (landfill).




#### **Area Method Advantages:**

- Provides an easy means of establishing the cost of the work at the time of bid opening
- Requires minimum labor for monitoring
- Is easy to monitor as the scope of work is well defined
- Is easy to determine when the contractor has completed the work
- The contractor assumes most of the risk

#### **Area Method Disadvantages:**

- Scope of work must be definable to minimize change orders for additional work
- May result in difficulty to quantify the amount of debris that will be brought to the right-of-way for removal
- Has a high probability of claims if debris estimates are difficult to estimate and require speculation

## Pass Method

 <b>Lump Sum - Pass Contract</b>	
Advantages	Disadvantages
<ul style="list-style-type: none"><li>• Minimum management needed</li><li>• Scope of work is more defined</li><li>• Quantities do not need to be documented unless change order submitted</li></ul>  <small>California Governor's Office of Emergency Services</small>	<ul style="list-style-type: none"><li>• Requires accurate, up-to-date plans</li><li>• Public must cooperate</li><li>• Public information officer needed</li></ul>  <small>Disaster Debris Management</small>

The pass method is used when the scope defines how many passes down a particular street or in a given section of the town will be completed. For example, if homeowners are provided a schedule for placing certain materials at curbside over a specific period of time (say three week duration), a scope of work can be prepared to require the contractor to conduct a minimum number of passes (say three) throughout the community during the three-week period (say one pass per week) and place the material at a specified location (landfill).

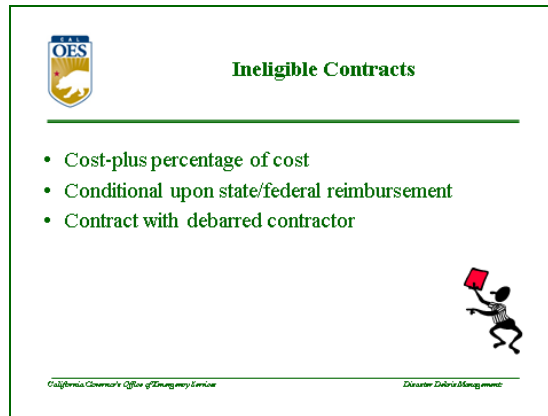
### Pass Method Advantages:

- o Minimum labor required for monitoring and management
- o Defines the scope of work better than Area Method and decreases the risk of claims caused by quantity speculation
- o Quantities do not need to be documented as they do in a unit price contract

### Pass Method Disadvantages:

- o Must have accurate, up-to-date plans and information on all roads that will be included in the “pass” scope of work
- o Public must cooperate in the removal process – placing debris on a schedule, segregating materials, placing only eligible debris
- o Contracting agency must be successful in communicating with the public in removal area

## Ineligible Contracts



The following conditions may result in terms of contracts, and associated work, being ineligible for Federal reimbursement.

- Cost-plus percentage of cost
  - o 44 CFR Part 13.36(f)(4) specifically precludes use of this contract type
  - o This type of contract encourages the contractor to exceed the initial cost estimates by basing their fee on a percentage of the costs
- Conditional upon state/federal reimbursement
  - o Contracts which indicate a contractor will be paid only upon receiving state/federal funds are ineligible
- Contracts with debarred contractors
  - o 44 CFR Part 13.35 specifically precludes use of debarred contractors
  - o Communities should check with the State for current list of debarred contractors

Information regarding contractors can be found on the California Contractor's State Licensing Board at: [www.cslb.ca.gov/consumers/default.asp](http://www.cslb.ca.gov/consumers/default.asp) or on the FEMA website at: [www.arnet.gov/epls/](http://www.arnet.gov/epls/).

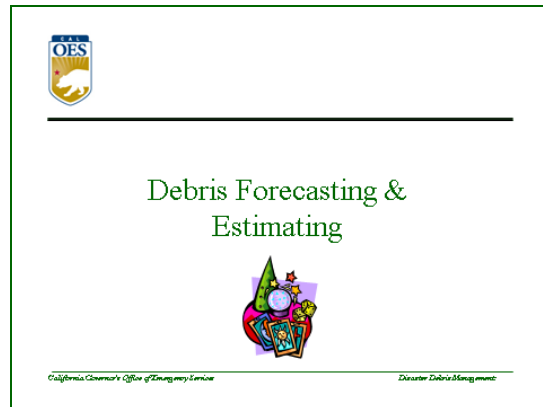
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# **Debris Forecasting and Estimating**

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## Introduction

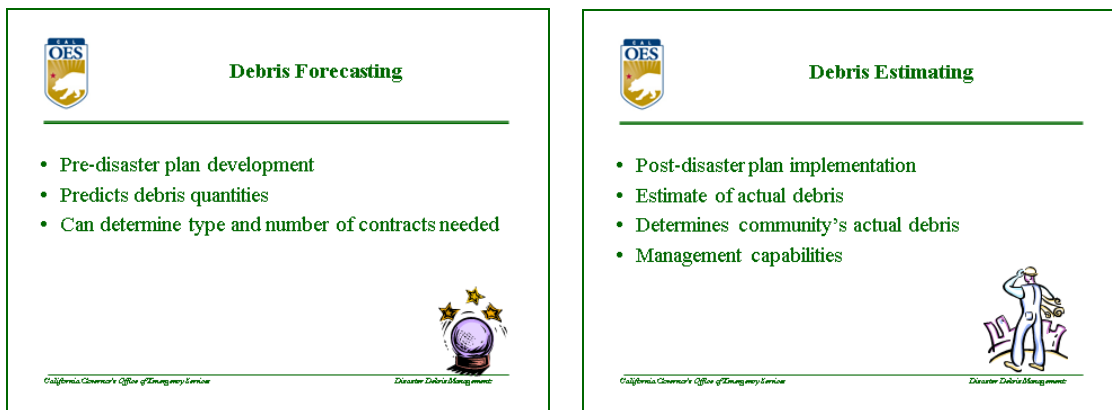


The purpose of this section is to present various debris forecasting and estimating techniques including various tools and rules of thumb to assist the Debris Manager in planning for large scale debris operations.

The determination of the quantity and type of debris is critical to debris management. Debris contracting, the management of Debris Management Sites and the possible need for State and Federal Resources (covered in following units) will require a reasonably accurate estimate of debris quantities.

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## Introduction – Cont'd



## Forecasting

Debris forecasting is normally a pre-disaster technique used to predict debris quantities.

Certain planning assumptions must be made concerning the type and magnitude of debris generating events.

For instance, the plan would assume that a specific type of event, such as a major earthquake in a heavily populated area, would affect the area with large quantities of primarily construction and demolition debris.

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Or, the plan may assume a range of debris generating events from small floods and tornados to catastrophic similar events.

Debris Forecasting can also be used to determine the type and number of stand-by contracts required to remove and dispose of the predicted debris.

### **Estimating**

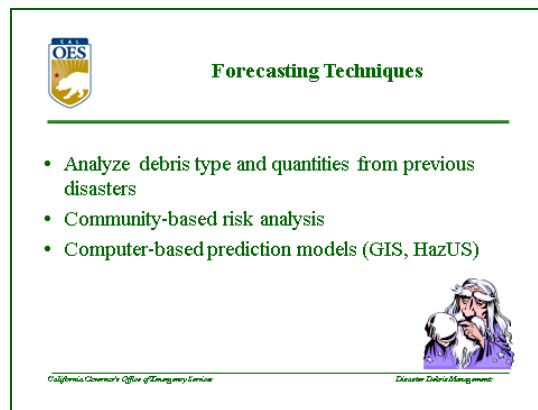
Debris estimating is normally used in a post-disaster situation to establish a reasonable estimate of the actual debris quantities and mix.

Debris estimates will be used to determine a community's actual capability to handle the situation.

Debris estimates will be used to determine the actual need for Debris Management Sites, contracts and landfill space requirements.

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### **Debris Forecasting Techniques**




There are three basic techniques that are used for debris forecasting:

- An analysis of prior debris generating events can be conducted for your community or a similar community. With this analysis completed it may be possible to plan for effective response to similar type events. However, because the event may have been limited in scope or experienced debris staff is no longer available, this method has severe limitations.
- More commonly, a community-based risk analysis is completed to determine the types and quantities of debris generated by various events. This analysis is then used as a critical component of the debris management plan.
- Computers can be used for both of the first two techniques to perform calculations and present the analysis. However, there are a range of computer-based prediction models available to perform some of the more routine calculations, use a community's Geographical Information System (GIS) and plan for any number of event scenarios.


When these three techniques are combined a very effective analysis can be completed.

## Debris Forecasting Techniques – Cont'd



### Forecasting Techniques Historical Analysis

- Analyze past events
- Interview staff
- Review changes in conditions
  - Land use
  - Landfill availability
  - Community response capability
  - Law & regulations



California Governor's Office of Emergency Services Disaster Debris Management

In order to complete an historical analysis of prior debris events, some basic information should be gathered:


- Prior event(s) should be selected from your community or from communities who have experienced the type of disaster you have forecasted for your community.
- Key staff members responsible for debris activities should be interviewed to determine procedures that were effective and those that were not.

An analysis of any effect in changes to the way your community would be able to respond to such events as:

- Land use changes that may increase or decrease the types of debris generated.
- A significant decrease in your landfill capacity or more current landfill regulations may have a very severe impact.
- An increase or decrease in your community's engineering or solid waste department staff could also make a difference in your response capability.


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## Debris Forecasting Techniques (Cont'd)



### Forecasting Techniques Community-Based Risk Analysis

- Get detailed maps of land use
- Create sample of debris quantities
- Project debris quantity estimate
- Interactive models
  - USACE
  - Private Industry
  - HazUS (FEMA)
  - HAZARD-Tech (NOAA)



California Governor's Office of Emergency Services Disaster Debris Management

A simple method can be used to systematically forecast the type and quantity of debris for a community.

- First, obtain detailed maps of your community and highlight them with an indication of the type of land use in each area, such as urban, industrial, rural and mixed. This area separation will make your analysis as similar land use areas can be assumed to have similar debris types.
  - o For instance: parks, orchards, groves, nurseries and tree-lined streets will have similar debris quantities based on an acreage or mileage basis.
  - o Commercial and Industrial areas tend to have heavy amounts of construction and demolition type debris.
  - o Residential areas can be a combination of vegetative, construction and demolition debris.
- Second, develop a representative sample of the debris in each area.
  - o Debris quantities can be estimated using the guidelines provided:
    - ♦ One story house = Volume in cubic yards times 0.33
    - ♦ Personal property from flooded home without basement = 25-30 cy
    - ♦ Single wide mobile home = 290 cy
    - ♦ Double wide mobile home = 415 cy
  - o The terms light, medium and heavy are somewhat subjective, but the general guide is: If there is very light vegetation covering the house, yard or driveway, it's light. If there is a canopy of trees covering the house, it's heavy. Use medium for everything else.
- Third, project the sampling of debris for each area and provide a total of the amount and type of debris for each area. The grand total of all these calculations will provide you with an estimate useful for planning purposes.

Understand that this type of debris forecasting is not an exact science. Broad assumptions and wide-scale projections must be made throughout the process. However, even with its inaccuracies, the resulting quantity estimate can be very useful in completing the next phases of the planning process, such as selecting Debris Management Sites or developing contracts.

Computerized modeling programs have been developed to provide reasonable debris predictions for communities under various disaster types. Types of these interactive models are:

USACE – Can provide debris plans from past disasters, as well as, technical assistance.

Private Industry - Consultants are available.

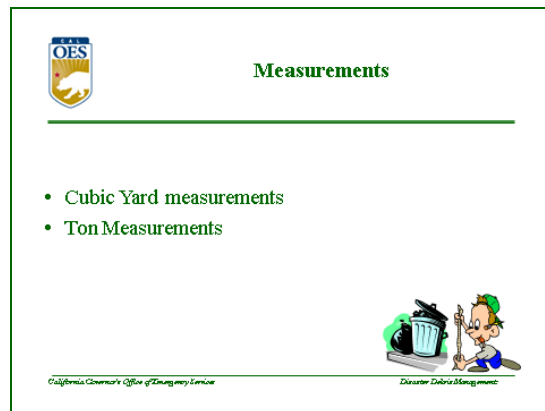
HAZUS (FEMA) - The **Hazards U.S. Multi-Hazard (Hazus-MH)** is a nationally applicable standardized methodology that estimates potential losses from earthquakes, hurricane winds, and floods.

Hazus-MH uses state-of-the-art Geographic Information Systems (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. It also allows users to estimate the impacts of earthquakes, hurricane winds, and floods on populations.

HAZARD-Tech (NOAA) - HAZARD-Tech is a free, public resource for hazard-oriented professionals, including mitigation planners, emergency managers, hazard scientists and engineers, geospatial technologists, and others.

The purpose of this Site is to provide an interactive environment that fosters learning and communicating. There is particular focus on exposing the technologies (tools) that support hazard management disciplines, and providing information in support of those tools.

## Measurements



Measurements can be done in many ways. In most cases, measurements are made by volume (cubic yards). However, if material is being taken to a landfill, there may be access to a scale for weight measurements. For demolition, contractors may use a lump sum price.

It is very important to record the process and basis for the estimate on the PWs (for public assistance funding) and other reports.

**Cubic Yard:** Cubic Yard (cy) measurements are often used to determine the unit price of debris (woody, mixed or construction & demolition) transported to a Debris Management Site or permanent landfill.

- All trucks being used to transport debris must be measured and the resulting quantity in cubic yards recorded on the side of the truck and recorded on all load tickets
- Trucks with less than full capacities will be adjusted down by visual inspection by the Field Debris Monitor who will verify the quantity and type of debris contained in the bed of the truck from an inspection tower
- Load tickets are often used to document measurements.

**Ton Measurements:** All trucks must have a certified tare weight (empty) established if payments are going to be made based on certified scale net weight receipts. Field Debris Monitors will be required to spot check trucks after dumping to see if they are still at their tare weight.

**Note:** *Gross weight – tare weight = net weight.*

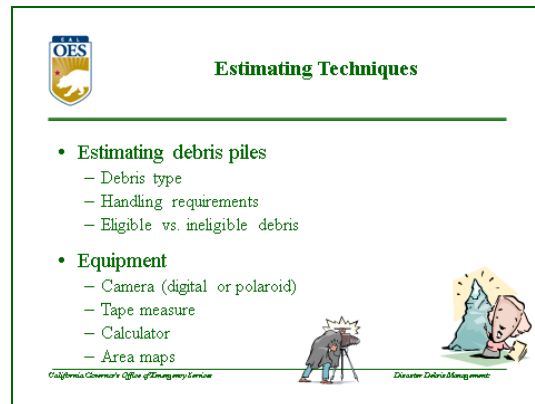
## Conversions

The following are rules of thumb. It will be necessary to do a field test to verify the makeup of the debris for your area and disaster type.

- Actual numbers can be very different. Taking an average load, measuring the truck, then weighing it will help determine what to use for a specific situation.
- When developing cubic yard (cy) measurements, divide cubic feet by 27.
- When converting from cy to tons, remember to use the correct factor:
- Use 2 if converting for construction & demolition material
- Use 4 if converting for woody material

- Rules of thumb:
    - o 15 trees 8 inches in diameter = 40 cy (average)
    - o Root system (8'-10' diameter) = may require one flat bed trailer to move
    - o To convert cy of C&D debris to tons, divide by 2
    - o To convert tons of C&D debris to cy, multiply by 2
- 

## **Debris Estimating Techniques**



There are many different ways to estimate debris. Being creative with the tools, techniques and information available to you can bring the best results. The following slides present various techniques and ways of using them alone and in combination with other techniques to provide the desired product.

### **Estimating Debris Piles**

There are many things to consider when estimating debris:

- First consideration: type of debris, for example:
  - o vegetative
  - o construction and demolition
  - o mobile homes
  - o a mix of different things
- Identify handling requirements, for example, if you will need to separate it.
- For PA funding, determine if the debris is eligible or what portion is eligible.

It is important to have the correct tools, aids and information in place when doing estimates. Debris estimates are only as good as the basic information used to create them.

- Ensure that necessary equipment is available, including:
  - o Digital (preferred) or Polaroid camera
  - o 100-foot tape or roll-off wheel
  - o Calculator, notepad, sketchpad
  - o Maps of area
  - o Aerial photographs (preferably before and after the disaster)
  - o Dedicated vehicle and mobile communications

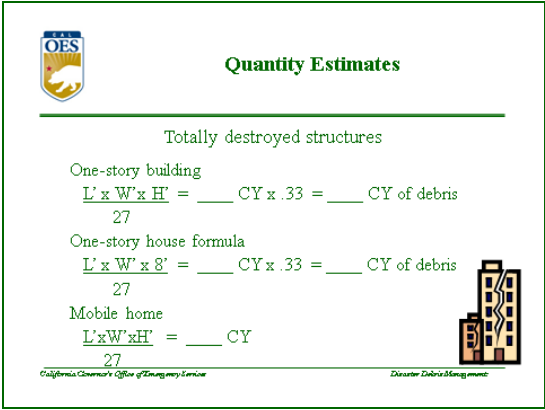
Once the equipment is in place, consider the area to be estimated and the manner in which the area should be divided (sectors). Debris estimating can be expedited by dividing the community into sectors based on any of the following:

- Type of debris: woody, mixed or construction material
- Location of debris: residential, commercial, or industrial
- Land use: rural or urban

Remember that however you define your area, you must be consistent with your system and keep detailed notes on how, where and what method you used for your estimates. These notes must be well documented and maintained for future reference. For Presidentially declared disasters, the information will be incorporated on the Project Worksheet.

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### Debris Estimating Techniques (Cont'd)



The graphic is titled "Quantity Estimates" and features the OES logo. It lists formulas for estimating debris from destroyed structures. For one-story buildings and houses, the formula is  $\frac{L' \times W' \times H'}{27} = \text{CY} \times .33 = \text{CY of debris}$ . For mobile homes, the formula is  $\frac{L' \times W' \times H'}{27} = \text{CY}$ . A small illustration of a mobile home is shown on the right. At the bottom, it says "California Governor's Office of Emergency Services" and "Disaster Debris Management".

**Quantity Estimates**

Totally destroyed structures

One-story building  
 $\frac{L' \times W' \times H'}{27} = \text{CY} \times .33 = \text{CY of debris}$

One-story house formula  
 $\frac{L' \times W' \times 8'}{27} = \text{CY} \times .33 = \text{CY of debris}$

Mobile home  
 $\frac{L' \times W' \times H'}{27} = \text{CY}$

California Governor's Office of Emergency Services      Disaster Debris Management

Estimating Aids – Buildings: The following information will assist you in determining the amount of debris from destroyed buildings, homes and debris piles:

- One-story building formula:  
 $\frac{L' \times W' \times H'}{27} = \text{CY} \times .33 = \text{CY}$
- One-story house formula:  
 $\frac{L' \times W' \times 8'}{27} = \text{cubic yards} \times 0.33 = \text{cubic yards of debris}$   
27' per cy  
(The 0.33 factor accounts for the “air space” in the house)
- Outbuildings  
 $\frac{L' \times W' \times H' \times .033}{27} = \text{cubic yards of debris}$   
27' per cy
- Mobile homes formula:  
 $\frac{L' \times W' \times H'}{27} = \text{CY}$   
27' per cy  
Length = L, Width = W, and Height = H. All measurements are in “feet”.

**Note:** The 0.33 factor is not applied to mobile home calculations due to their compact construction. The 27 factor is the conversion factor from cubic feet to cubic yards.

Typical quantities for mobile homes:


- Single wide mobile home = 290 cy of debris
- Double wide mobile home = 415 cy of debris

Participants typically have a difficult time accepting these numbers because they are larger than the standard stick-built homes. This has to do with the wasted air space in the average stick-built home. In mobile homes there is very little wasted air space – every inch of the unit is used in storage; the walls are narrower, etc.


These numbers were verified during Hurricane Floyd. The State of North Carolina demolished approximately 2,000 mobile homes following that flood.

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### Quantity Estimates – Cont'd




#### Quantity Estimates




Debris piles  
 $\frac{L' \times W' \times H'}{27} = \text{CY}$



Football field  
10ft high = 17,778 CY



Flood debris (household goods)  
Without basement = 25 – 30 CY  
With basement = 45 – 50 CY



Building demolition  
Area of building footprint x building height/3 = volume

California Governor's Office of Emergency ServicesDisaster Debris Management

**Debris piles:**

$$\frac{L' \times W' \times H'}{27} = \text{CY}$$

Length = L, Width = W, and Height = H. All measurements are in “feet”.

Reminders: The following reminders may be of assistance when performing debris estimates:

- Look beyond the curb into side and backyards and at condition of the homes. Most debris in these areas will eventually move to the curb
- Wet storms will produce more personal property debris (household furnishings, clothing, rugs, etc.) if roofs are blown away
- Look for hanging debris such as broken limbs after an ice storm
- Flood-deposited sediment may be compacted in place. Volume may increase as debris is picked up and moved.
- Using aerial photographs in combination with ground measurements will help determine if there are any voids in the middle of large debris piles
- Treat debris pile as a cube, not a cone, when performing estimates



## **Scattered Debris Quantities**

The quantity of scattered debris is difficult to estimate, and may involve a wide area. If the area can be clearly identified, then the following two methods may be helpful.

Average depth method - used to estimate concentrated debris fields.

- Calculate the area covered by the debris
- Make a rough estimate of the average depth of the debris.
- Multiply the average depth times the area to arrive at the volume.

Raked debris method

- Measure out an area of average debris quantity, such as ten yards by ten yards, or 100 sy.
- Rake or sweep together the scattered debris within that area into a cone-shaped debris pile.
- Estimate the raked debris volume using the cone volume method.
- Divide the debris volume by the measured area to get a volume per square yard.
- Multiply the result of Line 4 by the total area with scattered debris to estimate the total debris volume.

## **Building Demolition Quantities**

After a disaster, building may not have totally collapsed, but may be slated for demolition due to being a threat to public safety. Estimating the amount of debris that will need to be hauled away can be done by using the following formula:

- $\text{Area of building footprint} \times \text{building height} / 3 = \text{volume}$

In cases where a building changes its footprint or size at higher floors, the volume can be calculated by estimating the different footprint floors separately and adding the volumes together. There is some flexibility built into this calculation in the result to allow for the uneven shapes of the resulting debris.

**Example:** A 1930s-era high-rise was severely damaged and must be demolished. It has three footprints stacked on one another, one at 45,000 sf, 30,000 sf, and 18,000 sf, respectively. The lower two sections are five stories at 12 ft high per floor, and the upper section is three stories at 10 ft high per floor.

Calculate the debris volume in cubic yards.

Height of the sections: 5 stories x 12 ft/story = 60 ft.

3 stories x 10 ft/story = 30 ft.

$[(45,000 \text{ sf} \times 60 \text{ ft}) + (30,000 \text{ sf} \times 60 \text{ ft}) + (18,000 \text{ sf} \times 30 \text{ ft})] / 3 = 1,680,000 \text{ cf.}$

$1,680,000 \text{ cf} / 27 \text{ cf/cy} = 62,222 \text{ cy (rounded).}$

## **Explosions**

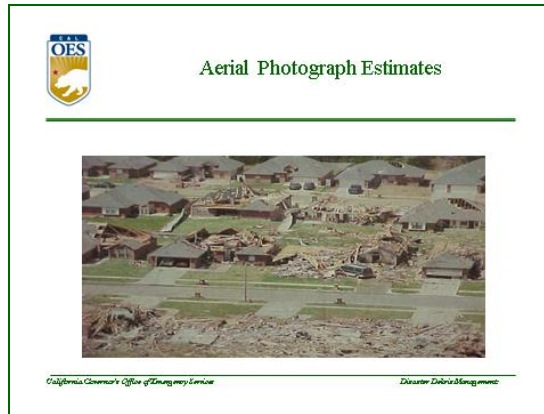
Debris fields from explosions are varied as the explosions themselves.

If the explosion resulted in a collapsed building or buildings, use the methods described in Building Demolition Quantities.

If this doesn't work, one of the other debris quantity estimating methods may result in a useful solution, including the scattered debris quantity methods.

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### Debris Estimating Techniques -Cont'd



Damage estimates can be made from available aerial photographs. A local newspaper supplied the above photograph.

To estimate debris using a photograph such as this:

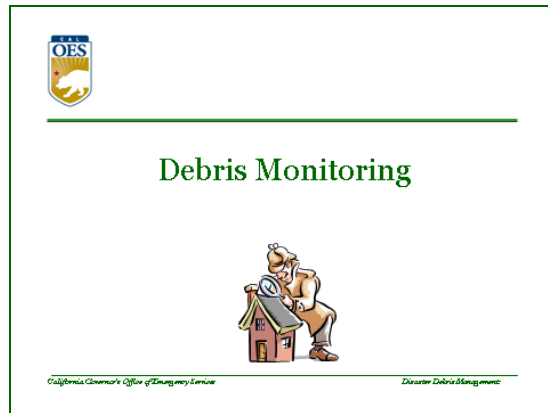
- Select an object in the photograph for which the length can be reasonably estimated, such as the truck.
- Measure the truck in the foreground and estimate its length at 25 feet.
- Apply that length to the intact houses to estimate the approximate length and width of each house. Calculate the approximate square footage by multiplying the length times the width. If you have houses of differing sizes, measure several and then calculate an average square footage.

**Note:** After the Oklahoma City tornado, photos from a news report and aerial photographs were used to do debris estimation. It can be very accurate in the right situation.

# Debris Monitoring

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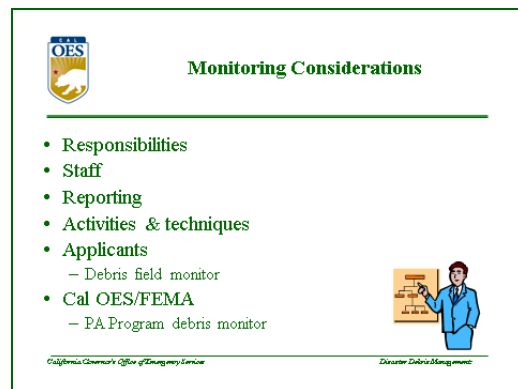
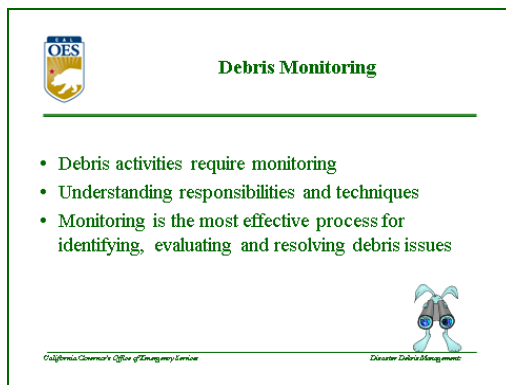
## Introduction



Debris activities require monitoring by trained and supervised personnel.

- Effective debris management planning requires a thorough understanding of debris monitoring responsibilities and techniques
  - Most importantly, debris monitoring is the most effective process for identifying, evaluating, and resolving debris issues
- 

## Debris Monitoring Considerations



Inadequate monitoring of debris activities often results in disputes between an applicant and the contractor, and/or the applicant and FEMA over Federal reimbursement for debris removal, reduction and disposal, and often loss of funding.

There are a number of monitoring considerations that are critical to effective monitoring of debris activities. These include:

- Responsibilities
  - Staff to perform tasks
  - Documentation and reporting requirements
  - Monitoring activities and techniques
-

- It is important to recognize that the monitoring process is used to both identify and resolve debris-related issues
- It is the primary responsibility of the applicant to independently monitor all debris activities, whether performed by their own force account labor or contract
  - For the purpose of this discussion, the applicant's monitoring staff is referred to as the Debris Field Monitor
  - The Debris Field Monitor is responsible for monitoring of the specific day-to-day field activities
- In Presidentially declared events, FEMA will perform overall monitoring of an applicant's debris activities. This does not relieve applicants of any of their own monitoring responsibilities.
  - For the purpose of this discussion, FEMA's monitoring staff is referred to as the Public Assistance (PA) Program Debris Monitor

### **Debris Field Monitor – Applicant Responsibility**

The applicant's Debris Field Monitor typically will:

- Be assigned to a specific task and be on site every day.
- Monitor specific activities at loading sites, debris management site inspection sites or landfills.
- Prepare a quantitative report of activities completed.
- Most importantly, identify and resolve debris issues.

For State/Presidentially declared disasters, it is the applicant's responsibility to provide sufficient documentation to support that:

- The scope of the work performed meets eligibility criteria.
- Often, a contractor or the applicant's own forces may perform activities that are not eligible for federal reimbursement while completing other eligible activities. Such work must be clearly identified, documented and quantified to minimize disputes when the work is completed.
- The quantities (cubic yards of debris, hours of operation, etc.) are adequately verified. The information provided by the applicant's field monitor usually provides the basis of this documentation.

### **Program Debris Monitor – State/ FEMA Responsibility**

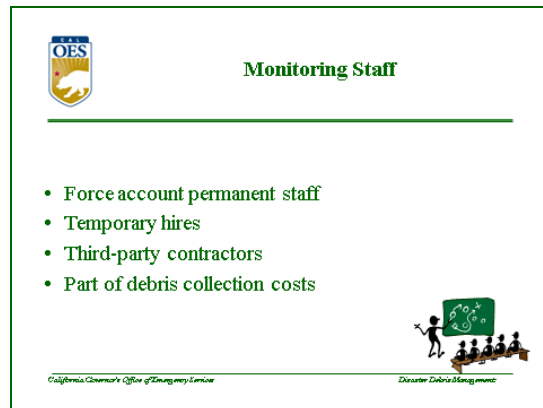
Cal OES/FEMA has the authority to monitor an applicant's debris operations, whether they be performed by an applicant's force account or contract. Often, a two-person, FEMA/State team will perform this function. Generally, the Program Debris Monitor will be staffed by:

- Debris Specialists – generally the most qualified for this role but may need additional support depending on the severity of the operations and number of Specialists deployed to the disaster
- Technical Assistance Contractors – often have this expertise
- Other State and/or Federal agencies, such as Caltrans or USACE

Typically these staff will:

- Make periodic site visits, depending on the magnitude and complexity of an applicant's operations.
- Assess operations compliance with the terms of the *Project Worksheets*, the contract, and the applicant's debris monitoring plan.
- Review field notes and/or reports prepared by the Debris Field Monitors.
- Compile payment and cost documentation for an applicant's operations.
- Prepare a summary report of observations, issues and resolutions.
- Provide training to Debris Field Monitors.

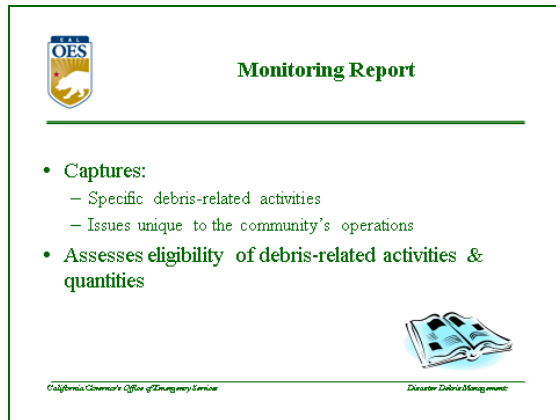
## Monitoring Staff



The applicant should use full-time debris monitors to account for all debris management activities.

- The applicant should never rely solely on the records or invoices provided by the contractor
- These monitors should be trained and properly supervised
  - o Cal OES/ FEMA may provide monitor training on State and/or Presidentially declared disasters, if necessary
- The size of the staff will depend on the operation, and may range from a few individuals who randomly monitor pickup and disposal sites (least efficient) to having a monitor at every pickup and disposal site (most efficient, most costly).
- Staffing may be provided by:
  - o Local force account labor or temporary hires. Retired employees can be a good resource.
    - ♦ Overtime or straight time eligible for their staff to meet FEMA's eligibility criteria in Presidentially declared disasters is for a:
      - permanent employee
      - temporary employee
      - seasonal employees
    - ♦ Indicate that because of the regular time restrictions, many applicants choose to use contractors to perform monitoring activities for declared events.
- Engineering firms usually have staff with construction experience that could provide the monitoring functions (these do not need to be professional engineers). The debris contractor, but rather an independent engineering firm should not employ this staff.

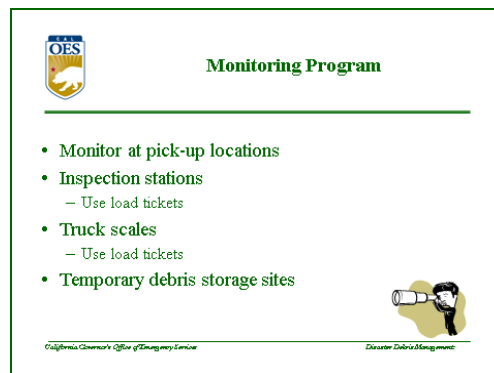
## Debris Monitoring Report



It is important to develop a monitoring system that includes a systematic method of identifying pertinent activities and recording relevant observations and data.

- A monitoring report should be developed to capture specific debris-related activities, based on the method of payment (force account or contract type) and other issues unique to the applicant's operations
  - The reports may also be used to assess eligibility of debris-related activities and quantities
- 

## Monitoring Program




A monitoring program observes and documents the work being done at two locations, minimum – point of collection and disposal (temporary and final). Some items to document at the various monitoring points include:

- Debris Loading Area
  - o Eligible debris is being picked up from contract area
  - o If debris types are separated at the curbside, check that the contractor keeps it separated
  - o Truck loads are full
  - o Tailgates are in-place
  - o If sideboards are in place
  - o Time of pickup



- o Load is reasonably compact – large obstructions are not restricting placement of material. Note that if the loads are not properly loaded on compacted, debris monitors should reduce the rated volume of the truck accordingly
  - Debris Unloading Area
    - o Truck size is as reported on the load ticket
    - o Determine proper debris quantities
    - o Check time of collection for reasonable turnaround
    - o Assure appropriate materials are properly segregated, such as HHW
  - Debris Management Site
    - o Record inactive times of contract equipment
    - o If air curtain incinerators are used, assure proper procedures
    - o Assure HHW is properly segregated
    - o Assure safety of personnel around equipment
    - o At a minimum, an elevated inspection station should be used to enable the monitor to look down into the truck to verify both the contents and the load amount.
    - o Monitoring should also be performed at the exit point of the Debris Management Site to ensure the load has been sufficiently dumped.
  - If the contract is by weight, then there should be a monitor at the certified scales
  - One of the best methods of monitoring is to use a load ticket system as discussed on the next slide
- 

### **Debris Monitoring Observations**




**Monitoring Program – Cont'd**

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Debris Monitors should:

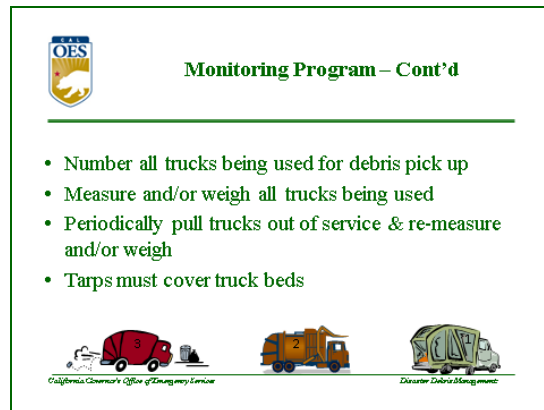
- Have a good understanding of eligible debris
- Understand any limits imposed on specific types of debris
- Observe operations to ensure ineligible debris is not picked up
- Watch for and stop illegal dumpsites

California Governor's Office of Emergency ServicesDisaster Debris Management

Debris activities require monitoring. Listed below are items to be aware of:

- Monitors should observe operations to ensure ineligible debris is not picked up.
- Monitors should have a good understanding of eligible debris (especially from private property) and any time limits imposed on pickup of specific types of debris. Examples (from actual occurrences) include sweeping areas for abandoned cars and white goods, cleaning up illegal dumpsites, removing cut trees from subdivisions under development, and removing/cutting trees from the right-of-way in rural areas.


## Debris Monitoring Observations – Cont'd



Prior to use, all trucks should be numbered, measured and load capacities (cubic yard or weight capacities) documented by truck number. Periodically, trucks should be pulled out of operation and re-measured.


- It is important to ensure that tare weights (empty) have been taken for each truck
- Remember that gross weight minus the tare weight equals the net weight. In this situation, the scale house operator was estimating the weight because the scale was broken. If this happens, then the quantity of material should be measured in cubic yards and converted to tons.
- California requires trucks to have tarps that cover the bed. If a monitor sees a truck without a tarp, he or she may want to take note of the truck number and report it to their supervisor. Remember that monitors are not law enforcement officers. Tickets received by the truck drivers for this are not reimbursable.
- Debris Management Sites should have only one way in and one way out or have an inspection station at the exit. Trucks have been reported driving through the disposal site without unloading, then re-entering with the same load.
  - o This can be detected by observing the time of departure and time of arrival recorded on the driver's load ticket
  - o This may also indicate problems with the community's debris monitors at the loading or unloading site.

## Debris Management Fraud



### Fraud

- Primary reason for importance of debris monitoring
- More & more occurrences
- Lack of debris monitoring will reduce funding
- Applicants bear ultimate responsibility for debris monitoring



California Governor's Office of Emergency Services Disaster Debris Management

Fraud is the primary reason that debris management has come to the forefront and under such severe scrutiny. During several disasters, glaring incidents of fraud have occurred that have given rise to the importance placed on debris monitoring.

One instance is that after a major hurricane struck Guam; various officials from FEMA and Guam were flying over the area observing the damage and recovery operations. While flying over several mounds of debris it was noticed that the piles were not piles but donuts. The centers were empty, but the piles were being measured (cubic yards) as if they were whole.

During debris removal operations for the World Trade Center, the following occurred:

- FEMA installed GPS tracking devices that were removed from trucks
- Debris was picked up from non-disaster related sites

Other incidents of fraud have included:

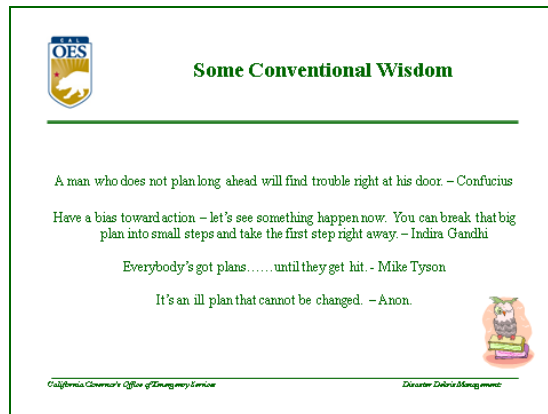
- Occasions when contractors have added excessive water to debris loads to increase the weight when being paid by the ton. This can be detected during monitoring before the load reaches the disposal site by observing excessive water dripping from the truck bed, or by inspecting the truck bed immediately after unloading.
- Contractors have been known to weld heavy grating to trucks after being measured. This is another reason to pull trucks and re-measure them.

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# DEBRIS MANAGEMENT PLAN

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## Introduction




This quote is an accurate statement especially for disasters. Everyone thinks they know or will know how to handle anything that is thrown their way. Sadly, as seen by the devastation from Hurricane Katrina, it's not always true. Plans themselves do not always work the way they are intended to, especially if you can't control all the elements involved. A proper planning process requires consideration of all possible elements and is of itself, priceless.

After years of fires, earthquakes and civil unrest, resulting in tons of debris, emergency management realized the need for a systems approach to debris management. This approach emphasizes the interdependency and connectivity of all aspects of debris management. The incorporation of debris management into local emergency planning activities is an essential element of disaster preparedness and cost-effective response and recovery operations.


The information presented is intended to assist in the development of a coordinated, statewide strategy for the management of disaster-related debris generated in California. This document also provides guidance to local jurisdictions regarding disaster debris management including planning tools, standard operating procedures, and disaster relief grant eligibility criteria. Assistance with more rapid issue resolution and informational resources are also provided.

## Not Another Plan!



### Why?

- **Promote planning process**
  - Invaluable experience
- **Coordinate with local, state, and federal agencies**
  - Resources & technical assistance
- **Use disposal alternatives**
  - Recycling, chipping, composting, salvage
- **Provide training and technical assistance**
  - Familiarize staff



California Governor's Office of Emergency Services      Disaster Debris Management

To maximize resources while minimizing the debris load to landfills following a disaster, local government is encouraged to incorporate debris management in their emergency and solid waste management planning activities. As part of the planning process, local government should identify any special considerations in their area of authority, potential disaster types, event characteristics and the debris anticipated as a result. Local emergency plans should be coordinated with solid waste planning to include debris management strategies, reuse and recycling opportunities, quantity estimations, landfill capacities, landfill class/type and potential temporary storage sites.

Successful debris planning efforts will result in more efficient use of limited resources, timely access to critical infrastructure and environmentally safe solutions to debris issues.

Local preparedness will assist the State in diverting significant amounts of recyclable materials that would otherwise be disposed of as debris and thus preserving the State's landfill capacity.


It is also essential that debris management planning activities become an integral part of other emergency planning activities within the jurisdiction. Local government should also participate in neighboring emergency planning activities, regional emergency planning activities and mutual aid planning to ensure the appropriate risks are factored into the planning process. Toward this end, Cal OES may provide technical assistance as appropriate to local government and facilitate the integration of state and federal requirements into these planning efforts.

The core components of the state disaster debris management strategy include:

- Promoting planning
- Coordinating federal, state, and local agencies and private companies
- Standardizing operational procedures
- Utilizing disposal alternatives
  - o Optimizing the use of limited resources
  - o Utilizing environmentally sound management approaches
  - o Applying economic criteria to alternative considerations
- Providing training and technical assistance regarding regulations, guidelines and policies.




## Considerations



### Plan Considerations

- Disaster Types
  - Amount & types of debris generated
- Roles & Responsibilities
  - Who's doing what
- Local Community
  - Vulnerabilities
  - Local landfills
- Resources
  - In-house, regional, state & federal capabilities
- Flexibility



California Governor's Office of Emergency Services      Disaster Debris Management


The main considerations of the plan should take into account:

- The type(s) of disaster(s) that potentially might occur, or have occurred, in your community.
- The magnitude of a disaster will require varying levels of resources – therefore, must consider:
  - Supplemental assistance available from local, State or Federal programs and resources
  - In-house capability to respond to varying magnitudes
  - Types of supplemental assistance that are available from mutual-aid agreements, the State Department of Transportation, or other external resources
  - The size and number of contracts that may be required
- Determine how to handle unforeseen contingencies. Be flexible.

**Note:** Go to the My Hazards website to see the potential events that could occur in your area (<http://myhazards.calema.ca.gov/>). This site can also show you how to reduce your risk. Remember the best way to recover from a disaster is to minimize the risks before the disaster happens.

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## Plan Outline




### Plan Outline

#### I. Staff Roles and Responsibilities

- Staffing Organizational Chart
- Roles and Responsibilities
- Staffing Assignments and Duties
- Administration
- Contracting and Procurement
- Legal
- Operations
- Engineering
  - Emergency Communications Plan
  - Health and Safety Plan and Procedures
  - Training schedule




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### Plan Outline

#### II. Situation and Assumptions

- Design Disaster Event
- Forecasted debris
  - Forecasted Types
  - Forecasted Locations

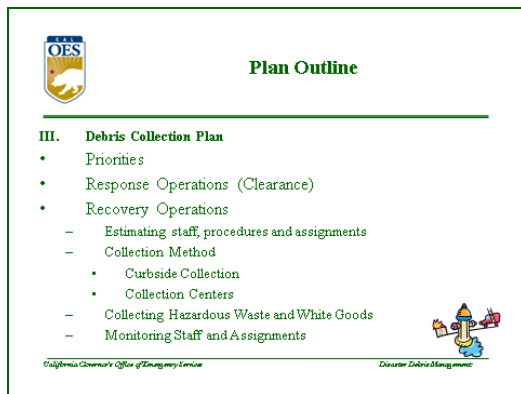


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Here is an example of a debris plan outline currently being favored by FEMA. Debris plans should incorporate and/or address the following elements:

- I. Staff Roles and Responsibilities
    - o Staffing Organizational Chart
    - o Roles and Responsibilities
    - o Emergency Communications Plan
    - o Health and Safety Plan and Procedures
    - o Training schedule
  - II. Situation and Assumptions
    - o Design Disaster Event
    - o Forecasted debris
    - o Forecasted Locations
- 

### Plan Outline – Cont'd



- III. Debris Collection Plan
  - o Priorities
  - o Response Operations
  - o Recovery Operations
- IV. Debris Management Sites
  - o Site Management
  - o Establishment and Operations Planning

## Plan Outline – Cont'd



### Plan Outline


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**V. Contracted Services**

- Emergency Contracting/Procurement Procedures
- Debris operations to be outsourced
- General Contract Provisions
- Qualification Requirements
- Solicitation of Contractors



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### Plan Outline

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**VI. Private Property Demolition and Debris Removal**

- Condemnation criteria and procedures
  - Legal documentation
  - Demolition permitting
  - Inspections
- Mobile home park procedures
- Navigation hazard removal procedures




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- V. Contracted Services
  - o Emergency Contracting/Procurement Procedures
  - o Debris operations to be outsourced
  - o General Contract Provisions
  - o Qualification Requirements
  - o Solicitation of Contractors
- VI. Private Property Demolition and Debris Removal
  - o Condemnation criteria and procedures
  - o Mobile home park procedures
  - o Navigation hazard removal procedures

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## Plan Outline – Cont'd




### Plan Outline

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**VII. Public Information Plan**

- Public Information Officer
- Pre-scripted information
- Public service announcements (PSAs)
- Distribution plan



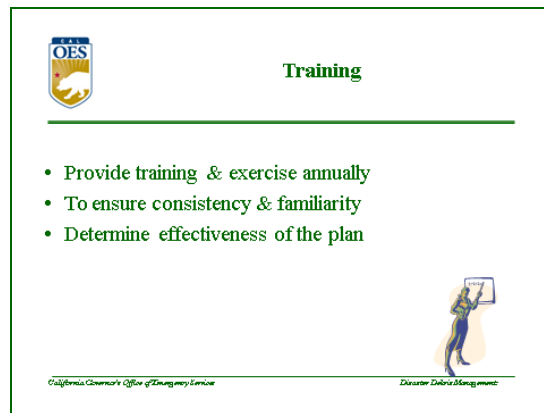
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Don't forget to include your public information office in your debris workforce and plan. They can provide valuable assistance to get the word out about proposed debris operations in the disaster area. They can help you send the message you want to those affected by the disaster.

- VII. Public Information Plan
  - o Public Information Officer
  - o Pre-scripted information/PSAs

- o Distribution plan

## Training



In order to ensure statewide consistency and adequacy of debris management operations, local, state and federal agencies should provide periodic training of the debris management plan to all potential participants in the debris management plan, including private companies franchised or contracted to provide service during a disaster. In addition, exercises should be developed to determine the efficiency and effectiveness of operational procedures. State agency resources are available to facilitate these training and exercise activities as well as technical assistance with debris management issues.

In addition, Cal OES can provide training regarding disaster debris planning, state and federal grant eligibility and reasonable costs of debris management activities, disaster debris contracting issues and requirements, and estimating disaster debris volumes.

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## Summary



The Debris Management Plan is a living document. Once written, the following actions must be taken:

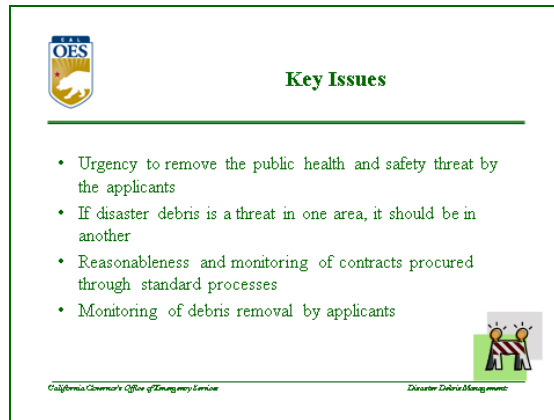
- The plan must be approved by the implementing agencies and departments, and adopted according to city/county requirements
- The community must ensure there are procedures for providing training
- The plan must be exercised to ensure it works

- The plan should be dynamic, reviewed and updated on an established, periodic basis

## **Lessons Learned**

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## Key Issues



Below are some important issues to be aware of are those found during reviews and audits made during and after previous disasters.

- Urgency to remove debris posing a threat to the public health and safety.
- If debris is a threat is one area, it should be in another area.
- Improper Contracts
  - Contracts were awarded without following appropriate bidding procedures.
  - Contracts were not properly reviewed before signing.
  - Costs per ton or cubic yard were excessive.
  - Contracts were not properly monitored or managed.
- There was no organized response to debris activities – no one was responsible for coordinating the effort.
- There was either no documented estimate of debris, or it was incomplete.
- Non-disaster debris was moved and charged to the disaster.
- Overall documentation was incomplete or insufficient.
- There was failure to comply with environmental or historic preservation legal requirements.

## Private Property Debris Removal



### Private Property Debris Removal Issues

- Needs approval from Cal OES and/or FEMA before operations begin
- Removal of ineligible debris
- Right-of-Entry (ROE) form
- Insurance
  - Applicant responsible for collection
- Trees
  - Must be a threat to public safety
- Chimneys
  - Must be threat to public safety
- Commercial Sites
  - Must be a threat to public health & safety




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Private property debris removal does have a few key points to keep in mind:

- Remember, an applicant **must** have prior approval from the State and/or FEMA before beginning this process.
- Private property debris removal is an action that gives communities a sense of hope and rebirth. However, you must remember that there are costs associated with this process and a significant investment of your time to ensure a successful outcome.
- Demonstrate the threat
- Ineligible debris
- Right-of-Entry (ROE) form
- Monitoring
- Insurance Recovery
  - Conventional coverage for debris removal
- Trees
- Chimneys
- Timely removal of debris
- Commercial sites
  - Debris must be an immediate threat to public health & safety.




## Monitoring



### Monitoring

- Applicant must monitor debris removal operations.
  - Ultimate responsibility is the applicant's, not the contractor
  - Pay attention, it's your money




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Monitoring is an important way to resolve issues and/or prevent problems from occurring or becoming insurmountable.


- Monitoring is in the applicant's responsibility and must be done.
- 

## Contracts



### Contracts

- Follow local/state/federal procurement codes & standards
- Document what you do
- Ensure costs are reasonable
- Include termination clause
- Cal OES & FEMA don't recommend contractors



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### Documentation

- Document everything
- Track costs during the event
  - Daily reports
  - Load slips
- Keep documentation safe and available upon request



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- Must use local/state/federal procurement procedures
- Documents the process
- Costs must be reasonable
- Include a termination clause
- Remember, Cal OES or FEMA do not recommend contractors.

## Remember



### Most Importantly

- Create a debris management plan.
- Be flexible.
- Remember that the applicant is responsible.
- Send daily reports
- Don't be afraid to ask:
  - For help
  - Questions
  - For a review of your debris removal plan



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- Create a disaster debris management plan.
- Be flexible, because you won't think of everything.
- The applicant is ultimately responsible.
- Send daily reports. Helps to document your case and can highlight a potential problem.
- Ask for help. It's what we do and it is **free**!

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## Contact Information



### Contact Information

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## **HUMAN REMAINS HANDLING**

### **Introduction**

This Appendix discusses some of the processes associated with recovery and disposition of Human Remains. The remains of many people are unaccounted for and many are still trapped in the rubble. Recovery of human remains in a dignified and respectful manner must be integrated with the debris stream processing. Remains should be recovered at the rubble site to the maximum extent practical. However, human remains may be encountered either at the disaster debris collection point or at a debris processing / staging site where transported debris is separated and processed. It should be noted that animal remains pose similar health hazards, and that the same safety and health requirements should be applied as appropriate when handling animal remains.

### **Health Risks Associated with Human Remains**

There is no direct risk of contagion or infectious disease from being near human remains for people who are not directly involved in recovery or other efforts that require handling dead bodies. The sight and smell of decay are unpleasant, but they do not create a public health hazard.

From the public health perspective of lowering the risk of possible infectious disease transmission, there is no requirement for mass burials or cremation. Response workers should assist local communities to identify a safe location for holding remains awaiting identification. This location should be shielded from public view if possible, and remains should be protected from scavenging animals.

For people who must directly handle remains, such as recovery personnel, or persons identifying remains or preparing the remains for burial or cremation, there can be a risk of exposure to blood-borne viruses such as hepatitis B virus (HBV) and HIV, as well as bacteria that cause diarrheal diseases, such as shigella and salmonella. For all others, blood and body fluid exposures are minimal, and the risk of contracting HBV is very low; the risk of contracting hepatitis C virus or HIV approaches zero. Transmission is relatively inefficient for these diseases, requiring percutaneous exposure (from a needle stick or exposure from a sharp penetrating object); direct contact with mucous membranes (such as eyes, nose, or mouth); or direct contact with non-intact skin (abraded, chapped, inflamed, or with visible wounds or traumas). Exposures on intact skin are not a risk for these blood borne infections.

Because a corpse will commonly leak feces, persons handling the deceased are more likely to be exposed to gastrointestinal organisms than to blood borne viruses. Workers may be exposed through direct contact with the victim's body and soiled clothes, and transmission can occur via the fecal-oral route.

Contamination of other equipment, such as stretchers and vehicles used for transportation or storage, is also possible. However, common gastrointestinal organisms do not survive long in the environment and present little risk of infection where the body has been decaying for some time, or has been in the water.

These viruses and bacteria do not pose a risk to someone walking nearby, nor do they cause significant environmental contamination. Bacteria and viruses from human remains in flood water are a minor part of the overall contamination that can include uncontrolled sewerage, a variety of soil and water organisms, and household and industrial chemicals. There are no additional practices or precautions for flood water related to human remains, beyond what is normally required for safe food and drinking water, standard hygiene and first aid.

## **Human Remains Safety and Health Precautions**

Workers who handle human remains should use the following precautions:

- Wear protective clothing appropriate for preventing blood penetrating to underlying skin/clothing.
- Protect the face from splashes of body fluids and fecal material. Use a plastic face shield or a combination of eye protection (indirectly vented safety goggles are a good choice if available; safety glasses will only provide limited protection) and a surgical mask. In extreme situations, a cloth tied over the nose and mouth can be used to block splashes.
- Protect the hands from direct contact with body fluids, and also from cuts, puncture wounds, or other injuries that break the skin that might be caused by sharp environmental debris or bone fragments. Fluid-proof gloves (e.g., latex, nitrile, rubber) should be used and covered with heavy-duty work gloves if there is a potential for cuts and abrasions (e.g., moving debris). Footwear should similarly protect against sharp debris.
- Do not wear Personal Protective Equipment (PPE) or clothing that has been damaged or has been penetrated by body fluids. Decontaminate equipment before reuse; do not reuse gloves or other disposable PPE.
- Follow universal precautions, including washing any areas of the body or clothing that becomes contaminated with blood or bodily fluids. Maintain hand hygiene to prevent transmission of diarrheal and other diseases from fecal materials on hands. Wash hands with soap and water immediately after removing their gloves. In the absence of soap and water, use an alcohol-based hand cleaner after glove removal. However, wash hands with soap and water as soon as feasible.
- Give prompt care--including immediate cleansing with soap and clean water, and a tetanus booster if indicated--to any wounds sustained during work with human remains. Immediately report any injuries and exposures to body fluids.
- In addition to guarding physical safety, participate in available programs to provide psychological and emotional support for workers handling human remains. Agencies coordinating the management of human remains are encouraged to develop programs providing psychological and emotional support and care for workers during and after recovery activities.
- Hepatitis B vaccination will help prevent infection and will be 70% to 80% effective within one week of exposure. Those with a prior bacille Calmette-Guérin (BCG) vaccination may have some protection against tuberculosis, and tuberculin testing may be an appropriate follow-up measure.
- If available, use body bags to contain remains as they will further reduce the risk of infection and are useful for the transport of cadavers that have been badly damaged. However, body bags reduce the rate of cooling of the cadaver, thus increasing the rate of decomposition, especially in hot climates. If available, refrigeration can reduce the rate of decay and facilitate identification.

## **References and Additional Information**

For additional information regarding health risks related to human remains see:

- Pan American Health Organization web site at:  
<http://www.paho.org/English/DD/PIN/pr040923.htm>
- World Health Organization web site at:  
[http://www.who.int/hac/techguidance/ems/flood\\_cds/en](http://www.who.int/hac/techguidance/ems/flood_cds/en)
- Centers for Disease Control and Prevention at:  
<http://emergency.cdc.gov/disasters/handlerremains.asp>
- U.S. Army Center for Health Promotion and Preventative Medicine Fact Sheet 37-032-0905, *Handling of Human Remains from Natural Disasters*:  
<http://chppmwww.apgea.army.mil/documents/fact/37-032-0905.pdf>
- U.S. Army Center for Health Promotion and Preventative Medicine Technical Guide (TG) 195, *Guidelines for Protecting Mortuary Affairs Personnel from Potentially Infectious Materials*:  
<http://chppm-www.apgea.army.mil/documents/fact/37-032-0905.pdf>

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## **APPENDIX B**

### **DEBRIS REMOVAL FROM A CRIME SCENE**

This information comes from a document prepared by the federal Department of Homeland Security. It was created from interviews conducted with personnel who responded to the Alfred P. Murrah Federal Building Attack, including FBI, Oklahoma City, OK Fire Department, and State of Oklahoma Division of Emergency Management. March 9-10, 2005. While the emphasis of this section is focused on a Weapon of Mass Destruction (WMD) incident, it is applicable to other terrorist events where debris is part of a criminal investigation.

#### Introduction and Purpose

It is essential for public safety, and for purposes of crime scene investigation that the site of a Weapon of Mass Destruction (WMD) incident is secured during the initial response, and maintained during the recovery operation. The purpose of this document is to help local governments establish methodologies to be utilized at a crime scene that focus on law enforcement concerns such as site security and the safeguarding of evidence. The early response phase of a critical incident must prioritize public safety and responder safety. The securing of or collection of evidence should never be prioritized higher. However, the scene and the evidentiary possibilities must be safeguarded while simultaneously meeting the life safety objectives. The large quantities of debris generated by a WMD and/or terrorist incident can be a logistical problem for planners. It is important to have an understanding that the debris must actually be considered evidence until the lead law enforcement agency has declared it clear of evidentiary possibilities. As debris is removed in order to meet the rescue and recovery objectives, it should be handled in a secure fashion. Typically, in a small scale crime scene, evidence recovery does not begin until the rescue and recovery phase of the operation is complete. However, in a large scale critical incident, the large amount of evidentiary debris to be removed and processed creates the need for operations to run concurrently with first responders rescue and recovery operations. A timely investigation, including evidence collection, should begin as promptly as possible. A lengthy recovery phase could cause a significant delay. Small scale crime scenes typically do not present this amount of debris or this situation. Incident command is critical to managing these multiple objective operations. This chapter addresses law enforcement agency responsibilities, and security and evidentiary issues of debris management during the rescue and recovery phases of the WMD debris operation.

#### Lead Agency

When a WMD incident occurs, many local, state, and federal law enforcement agencies will respond and play significant response and investigative roles. However, only one law enforcement agency will be named the lead law enforcement agency. In matters of the investigation of terrorist acts or terrorist threats by individuals or groups inside the United States, or directed at United States citizens or institutions abroad, Homeland Security Presidential Directive/HSPD-5 grants lead responsibility to the Attorney General. The Attorney General will usually designate the Federal Bureau of Investigation (FBI) as the lead investigative agency. While other local, state, and federal agencies will play significant roles in the investigation, case management decisions will be made by the FBI. This includes decisions regarding WMD evidence management, collection, and preservation. Local law enforcement roles generally include perimeter establishment and security, control of site access, escorting transported debris, and assisting the FBI in the collection, preservation, and documentation of evidence.

### Role of the FBI

The FBI is typically not considered a first responder asset, but rather a follow-on asset that will begin management of the investigation and the crime scene. It is the responsibility of the first responder community to make the initial response, initiate search and rescue operations, establish scene security, and implement life safety measures. However, for larger cities the Bureau may be among the first responders, as it was for the Oklahoma City Bombing. In the attack on the Murrah Building, the FBI office was in close proximity to the bomb site, and a substantial number of agents were immediately at the site actively engaged in the recovery effort (Reference). It is paramount that the FBI interface with the on-scene first responder community in order to meet Bureau objectives and yet not disrupt the ongoing operations of police, fire, and EMS personnel. In order to properly interface with the first responder assets, the FBI will operate within two management structures. These are: 1) Joint Operations Center (JOC), and 2) as a component of the Incident Command System (ICS)/Incident Management System (IMS). Both allow for appropriate interface with local agencies.

### Joint Operations Center (JOC)

The JOC is the FBI-led coordination center for crisis management, and is typically located away from the incident site(s). The JOC is a multi-agency center from which the investigative needs of the incident are addressed. It is critical that local agencies also have a presence in the JOC.

### Incident Command System/Incident Management System

The ICS/IMS is the task level management structure for incident management concerning the event. The FBI will have representation in several functional areas of ICS/IMS, including a senior level Bureau Official in Unified Command, and FBI operational assets in the Operations Section. It is critical for local, state, and federal agencies operating within the ICS/IMS to liaison with FBI assets in their respective areas. Multiple incident sites will require additional ICS/IMS functions, and each will have FBI representation as required.

Pre-planning and training have significant positive impacts on the command response to major incidents. Oklahoma City first responders had a response drill just weeks prior to the bombing of the Murrah Building. Pre-event planning and periodic training/exercise participation to validate plans is essential for success. Training and exercises should include all other area responders as appropriate.

### FBI Operations

The FBI Field Office having geographic jurisdiction will have lead authority for the investigation. FBI evidence recovery operations will take place in coordination with Public Safety Officials in the Unified Command function of ICS/IMS to ensure emergency operations are completed without conflict with life safety activities.

The FBI may engage the services of internal response assets to assist in evidence collection and management. The FBI Evidence Response Team (ERT) from the FBI Field Office having geographic jurisdiction, will have lead authority in the collection of evidence from the terrorism incident site and



from any remote recovery site. The FBI Hazardous Materials Response Unit (HMRU) and Hazardous Materials Response Team (HMRT) personnel will facilitate the collection of contaminated evidence from the incident site, and any remote recovery site in coordination with the ERT having jurisdiction.

The HMRU will establish a Safety Officer at the incident site and any remote recovery site to address all FBI safety concerns. The HMRU will develop a Site Safety Plan for all FBI Operations. The FBI site safety plan will encompass the specific FBI Operation, FBI personnel, and others assigned to FBI Operations. This site safety plan will be coordinated with the overall site safety plan, but will be site and mission specific to FBI operations.

The evidence recovery operation will be conducted utilizing standard FBI ERT evidence collection procedures. Any WMD evidence destined for laboratory analysis will be collected under the auspices of the FBI HMRU Science Program. The WMD evidence will be packaged for safe transport and transported by the HMRU.

### Maintaining Integrity of Crime Scene

Initial site security is initiated by the local response. A perimeter is established in the course of protecting the public and giving adequate space for response workers, equipment, and vehicles. This original perimeter will be maintained or possibly expanded by local law enforcement with regard to protecting the outer limits of the crime scene. Planning must begin early to strengthen this perimeter with physically durable materials such as chain link or other fencing.

### Perimeter Establishment and Enforcement

An outer perimeter will be established at the initial site. This outer perimeter should be large enough to guarantee the integrity of the site. The crime scene must be protected so that no external parameters are allowed to impact it or the procedures conducted within it. An inner perimeter will be established around the actual crime scene, to include the farthest piece of evidence from the incident site. The inner perimeter location is initially determined by local law enforcement personnel unless the FBI is among the first responders in which case it will be done jointly. Additional inner perimeters or zones may also be created as necessary to separate specific work areas or break areas. The area between the inner and outer perimeter will be utilized for ICS/IMS operations, staging, logistics, planning, and other incident related activities.

Some initial sites may have adequate space to allow for the creation of evidence (debris) processing sites within the inner perimeter. In most cases, this is not possible and arrangements must be made to transport evidence (debris) to an offsite location for processing. In this event, both inner and outer perimeters must also be established for any remote work sites associated with evidence processing and recovery.

Entry into the inner perimeter will often require donning of appropriate personal protective equipment. This requirement should be strictly enforced by the Site Safety Officer. Logging name, date, and time of entry through a controlled check point is also required. This includes vehicles. This controlled check point is generally the first point where responders are required to wear the appropriate personal protective equipment (PPE) to make entry. This control should be monitored and maintained within the inner perimeter for responder safety. Failure to properly wear the PPE according to the site specific safety plan

should cause the removal of the offending responder(s) from the work area by the Site Safety Officer. An accountability system for inner perimeter responders should also be utilized for responder safety.

At the Murrah Federal Building in Oklahoma City, three ringed perimeters were initially established which encompassed security for the various command posts and Unified Command. Media were contained within the outermost perimeter. The inner two ringed perimeters were both totally secured with only one ingress/egress for first responders, i.e. fire, law enforcement, and EMS to include hospital/triage.

At the Pentagon 9-11 site, three ringed perimeters were also established. The outer perimeter contained parking for responders' vehicles, food, beverage, restrooms, and other support for responders and a credentialing station. The second perimeter allowed for individual agency forward command tents, equipment, and responders assigned to shifts. This perimeter utilized one ingress/egress point. The inner perimeter required specific work assignments and required the wearing of PPE. The ingress/egress point was tightly controlled by a safety officer to ensure responder accountability and the proper use of appropriate PPE. Entries into the inner perimeter were coordinated with Incident Command so as not to interfere with operational tasks and to provide for the safety of the crime scene responders.

In the early days of the World Trade Center (WTC) response, perimeter establishment and security was addressed by the New York Police Department (NYPD). The National Guard eventually took over the responsibility of perimeter security from NYPD. Managing the objectives of the various response agencies through a Unified Command is necessary to minimize confusion about giving access to perimeters to authorized personnel.

#### Site Access and Credentialing

The size of the perimeter and the number of responders make perimeter security a difficult task. Unauthorized individuals and media personnel will attempt to penetrate the perimeters. Planning should include efforts to establish appropriate resources to provide for on-scene credentialing for all personnel. With multiple agencies responding to assist in the recovery efforts, a common identification system is most secure and may be more efficiently monitored by security personnel. A credentialing point should be located outside of the outer perimeter and easily accessible by responding agencies. Color codes or other identifying marks may be utilized to represent approved work zones for an individual. An additional layer of security may be added by marking identification with specific codes for each day to minimize counterfeiting ID's. The entry and exit of the outer perimeter should be made at designated control points. Name, date, and time of entry or exit should be logged at these control points to include vehicles as discussed previously for the inner perimeter. The Murrah Federal Building site and the Pentagon 9-11 site both utilized a credentialing system that provided for a standardized identification card with photo for each responder. Color codes on the identification cards dictated the authorized work areas for that responder. The media at the Murrah site were also vetted and issued identification with limited access to the outer perimeter.

Credentialing of responders at WTC was necessary due to the overwhelming number of out of town responders self-dispatching to the area. Once a credentialing system was in place, issued credentials clearly stated what areas of the site an individual had authority to enter.

Media access into the perimeter must be approved by the JOC, and access will be by law enforcement escort only. The inner perimeter should not be made available to the media. Any other special requests

for site access should go through the JOC for approval. The JOC may also establish no-fly zones through the Federal Aviation Administration to further secure the perimeter from unauthorized access

### Evidence Collection and Preservation

#### **Chain of Custody**

Chain of custody technically begins once an item has been collected. As debris is removed from a site for transport to another site for processing, it is technically being collected at that point in time. Any transport of collected debris should be documented well so that a chain of custody of the material may be established. Documentation should contain the names of equipment and truck operators, date, time, and work zone. The debris that is transported should be accompanied by, or monitored by a law enforcement officer until it has been delivered to a remote secure site where custody is transferred. This transport includes all means of transport including use of waterways. A more specific chain of custody will begin once an item has been located in the debris, and then tagged, and logged according to FBI ERT protocols.

At the Murrah site, almost immediately after being identified as a terrorist incident, the FBI was designated as the lead investigative agency. The Federal Rules of Evidence were applied to the collection of evidence and documentation of the scene. Chain of custody, receipt and logging of evidence, and scene documentation were all specifically designated responsibilities. Training on process procedures and methodology was given before anyone was assigned to a search team. This included fire, EMS, and hospital personnel.

At the WTC site, evidence collection procedures were established immediately between the FBI and NYPD Crime Scene Unit. Evidence logs, chain of custody logs, photo logs, and victim/remains logs were implemented. After several days, computer databases and bar code systems were put into place. Manual logs continued as back up documentation.

### Evidentiary Processing and Debris Considerations

Transport of debris with evidentiary possibilities should be tracked so chain of custody may be established. Evidence located and collected at the original site should be logged, tagged, and secured at a designated evidence receiving area on location. The remote processing site will have its own log and evidence receiving area. Planning should include the establishment of a receiving point to secure large quantities and varying sizes of evidence. An offsite warehouse that can be secured by law enforcement twenty-four hours a day is a good option. Another option is large storage containers that may be moved by truck or train at a later time. Law enforcement will have final approval to transition debris from an evidence status to a clear debris status. This approval is made by the FBI through the JOC.

In Oklahoma City, the debris was trucked from the Murrah Building site to the searching and sifting site which was located at the Oklahoma County Firearms Range in a secured area which was identified as non-contaminated. Large sifter/shakers used in ore mining operations were brought in for evidence recovery and only post blast scene, trained personnel were utilized for this process. Transport trucks and drivers were vetted and trained on what they could and could not do during the transportation process, and all were escorted by local police. Investigators were positioned at each debris removal point to observe

for evidence during the loading process. Debris was moved by Public Works and contracted labor to the county gun range. The Oklahoma County Sheriff's Office provided the debris security.

The Pentagon 9-11 site was large enough to maintain the debris removed from the Pentagon on location within the secure perimeter. Of course, there was significantly less debris to be processed at this site as compared to the Murrah site or the World Trade site.

At the WTC site, debris was moved with heavy equipment and trucked to an alternate location, the Fresh Kills Landfill in Staten Island, to be further processed for evidence. Security at this alternate site was provided by the NYPD. The loads of debris were trucked to the site under police escort. Teams of detectives and FBI Agents raked through debris fields created by mechanical sifters and searched for evidence and remains. Eventually, the New York City Department of Sanitation (DSNY) made it possible to carry debris by barge. Escorted trucks of debris would dump onto barges which would dump back to trucks near the landfill. The trucks would then haul the debris to the landfill for processing. This delivery process was under police escort and observation.

In some cases, remaining post blast structures must be imploded. The additional debris created by this action must be removed and protected from looters. In most cases, imploded debris has no evidentiary value. Care should be taken to keep the exploded and imploded debris separate. At the Murrah site, a thick mylar plastic was used to cover the entire area where searching was incomplete to protect the potential evidence and to identify the area remaining to be searched. After implosion, the debris, down to the plastic layer was removed to a different secondary site which was secured from public access, but not secured as evidence. The decision to implode the Murrah building was made after search day eleven. At that time, chances of a live rescue were severely limited, and the structure of the remaining building was considered unsafe for responders.

#### Contamination Considerations (CBRN): Non-conventional

A non-conventional WMD incident brings on additional, significant concerns and considerations. Downrange operations within the inner perimeter are likely to require high levels of PPE, training, and OSHA certification to work there. This will include all responders, equipment operators, truck drivers, and visitors. This will significantly slow down all operations. Work times downrange will be severely reduced, bulky, hot PPE will tire responders and workers more quickly and they will require longer rehabilitation. Decontamination of victims, personnel, debris, and evidence will be required. Debris that will be transported to offsite locations must be appropriately containerized prior to leaving the inner perimeter (hot zone). Also, the receiving facility for remote operations must approve the receipt of hazardous materials. In effect, the development of an offsite processing area creates a new, hazardous area requiring all the safety considerations as for the initial site. Early sampling for lab analysis will provide identification of contaminants which will aid in determining PPE requirements and decontamination decisions and in the development of safety plans regarding the movement and placement of the hazardous debris. Incident Commanders have access to specially trained National Guard assets for non-conventional incidents to support hazardous materials operations. These support units are Civil Support Teams (CST). They have been equipped, and trained to perform detection, collection, mitigation, and presumptive on site analysis at chemical, biological, radiological, and nuclear incidents. A CST may be requested by the Incident Commander through the Governor.

Debris at the WTC site that was trucked or moved by barge was covered in order to containerize the materials. The barges and trucks were also sprayed down with water prior to transport to reduce the airborne dissemination of potentially hazardous particulates.

### Human Remains Recovery

As in any crime scene, human remains are considered evidence. However, the Medical Examiner that has jurisdiction in that area has ultimate control and authority over the remains. It is important to the identification, and cause of death objectives of the Medical Examiner, and to the investigative needs of the FBI that the remains' location and other information pertaining to it are adequately documented. Planning to meet this objective should include the Medical Examiner, the FBI, and local/state law enforcement personnel. In WMD incidents, much of the human remains will be located and recovered in small amounts. These remains are typically recovered as found in biological containers or biological bags without a physical response from the Medical Examiner. However, information on location, collector, date, and time will be documented as dictated by the Medical Examiner's recovery plan. When intact or somewhat recognizable remains or larger segments of remains are located, the Medical Examiner, or their designee will be notified, and escorted to the remains for documentation and collection. The Medical Examiner will take custody of all remains, regardless of size. Planning should occur through the Medical Examiner for securing a refrigerated location near or on site to receive human remains on a daily basis. All remains, regardless of size, need refrigerated storage.

Normally, it is the responsibility of the Medical Examiner to initiate chain of custody and identification of bodies and human remains. At the Murrah site, fire personnel would escort a Medical Examiner representative to intact human remains when located in the debris. The Medical Examiner's representative would document location, date, time, name of collector, photograph, start chain of custody, and remove the body. Law enforcement personnel were assigned to the morgue to secure evidence recovered from the remains and to establish and maintain the chain of custody for that evidence. A temporary morgue was established in refrigerated trucks for initial processing. More complete processing was conducted at the Medical Examiner's Office.

Human remains contaminated with WMD material create additional contamination issues. Decontamination of intact remains is a possibility. However, there is a concern as to the loss of evidence on or lodged inside the remains. Decontamination of partial remains would be extremely difficult. Most decontamination solutions could also damage the DNA analysis utilized for identification of the remains. The type of contamination on the remains would also be a determinant in the type of decontamination necessary and how harmful it will be to the DNA analysis. This decision is one to be made by hazardous materials professionals, the Medical Examiner, and the FBI in order to prioritize and meet objectives. Temporary refrigerated storage may be necessary (refrigerated trailers) to continue morgue operations.

See the next section, Recovery and Disposition of Human Remains and Personal Property for additional information.

### Personal Property Recovery and Release



The lead law enforcement agency, FBI, through the JOC will ultimately decide what debris or other items are cleared for return to appropriate owners. Once all evidentiary possibilities have been considered for a particular item, a decision to release the items may be made. If the item is contaminated by a WMD material, further testing will be required. Generally, law enforcement and fire departments will not be available for the decontamination of personal property. Hazmat clean up contractors may be available to perform decontamination procedures at the owner's expense. The contractors would then follow up with surety testing to provide data that the items were in fact decontaminated. Ultimately, it is the responsibility of the Public Health Department to review the data and give final approval for the release of any contaminated property. This is the procedure utilized for the release of contaminated buildings and residences as well.

Personal property from the Murrah site such as jewelry and money was also tracked through the Medical Examiner's Office with an accounting of valuable items by evidence technicians. Vehicles that were part of the crime scene were processed for evidence (vehicles contained blast fragmentation) and retained as evidence. Any items removed from the scene as personal property, evidence, or property of other government agencies must be documented. During the trial of Timothy McVeigh for the bombing of the Murrah Federal Building, the defense challenged the removal of items from the scene that were not documented on official evidence or property logs. Certain federal agencies that were housed in the Murrah Building removed some of their training devices and secure equipment from the debris. This type of property return had not been documented appropriately and created an issue for the prosecution. The defense alleged that the Federal Government was attempting to secretly remove "devices" from the crime scene. All property, evidentiary or not, that is removed from the debris should be well documented. See Chapter 7, Recovery and Disposition of Human Remains and Personal Property for additional information.

#### Operational Security (OPSEC)

Employment of a WMD may result in classified items becoming mixed within the debris. The Murrah Building in Oklahoma City housed office space for the Bureau of Alcohol Tobacco, and Firearms (BATF), and The United States Secret Service (USSS). Many items from gun vaults, and evidence vaults and case file rooms were lying unsecured within 1-2 blocks of the building. The Pentagon had many unsecured safes containing classified information that were left open upon evacuation. As first responders discover these items and situations, a procedure is required such that these items may be immediately secured. Immediate notification and retrieval by an agency representative works well. Any agencies with potential exposure of classified documents or items should have a representative to make recovery on-site as well as a representative located in the JOC.

Each federal agency that had a presence in the Murrah Building also had a presence within the initial task force infrastructure. As classified or sensitive items or documents were recovered, they were immediately turned over to their respective agency representative. This must be documented as well.

#### Checklist

- Establish Incident Command/Unified Command, and begin immediate interfacing with other local, state, and federal responders.
- Secure outer and inner perimeters. Begin to locate large quantities of adequate fencing to strengthen the perimeter.

- Local law enforcement and FBI should establish evidence collection, and documentation processes, and protocols early on. This should include a database for data storage and retrieval.
- Establish a credentialing system, both equipment and operators. Locate an offsite area for this purpose, and designate that site as the reporting location for additional follow-on responders from other jurisdictions (local, state, and federal, etc.) Discourage responding agencies from reporting directly to the incident site. In-processing is required first.
- Locate a secure offsite location for debris to be stored and processed. Hazardous vs. non-hazardous debris is a consideration for location. It may be necessary to locate storage containers or warehouse space to store collected evidence.
- Procure heavy equipment and operators. The operators may need evidence awareness training or other specialized training such as certifications to work in a hazardous environment, or to utilize the equipment to perform search and rescue operations.
- Assist Medical Examiner's Office in locating additional space for morgue operations such as refrigerated trailers or other cold space. Coordinate with the ME's office for human remains documentation and recovery plan.